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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	04/30/2019	10276162	Q231458	5067

23373 7590 04/10/2019
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Arunabha CHOUDHURY, Bangalore, INDIA;
SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF;
Sriram NAGASWAMY, Bangalore, INDIA;

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IR103 (Rev. 10/09)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS

(Note: Use Block 1 for any change of address)

23373

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, NW
SUITE 800
WASHINGTON, DC 20037

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s)

Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067

TITLE OF INVENTION: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

APPLN TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	Undiscounted	\$1000	\$0	\$0	\$1000	04/10/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
RILEY, MARCUS T	2677	704-244000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363)
- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached.
- Use of a Customer Number is required.**

2. For printing on the patent front page, list
- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. Sughrue Mion, PLLC
2. _____
3. _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

SAMSUNG ELECTRONICS CO., LTD.

Suwon-si, Republic of Korea

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fee(s) submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies

4b. Method of Payment (Please first reapply any previously paid fee shown above):

- ☒ Electronic Payment via EFS-Web ☐ Enclosed Check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 19-4880

5. Change of Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

- ☐ Applicant asserting small entity status. See 37 CFR 1.27.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be as a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Christopher R. Lipp/

Date March 12, 2019

Typed or Printed Name Christopher R. Lipp

Registration No. 41,157

Electronic Patent Application Fee Transmittal				
Application Number:		15429715		
Filing Date:		10-Feb-2017		
Title of Invention:		METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
First Named Inventor/Applicant Name:		Arunabha CHOUDHURY		
Filer:		J. Lytle/Konata George		
Attorney Docket Number:		Q231458		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt	
EFS ID:	35393511
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	J. Lytle/Konata George
Filer Authorized By:	J. Lytle
Attorney Docket Number:	Q231458
Receipt Date:	12-MAR-2019
Filing Date:	10-FEB-2017
Time Stamp:	11:39:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	031219INTEFSW11401900
Deposit Account	194880
Authorized User	Konata George
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.20 (Post Issuance fees)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Q231458IssueFeeTransmittal.pdf	151128	no	1
			b13b9ba4e80cf5e6c308e7289f539be90f00c1bc		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30460	no	2
			8ff4691b65d2c9f6a548582fcfd5a80347bf2da8		
Warnings:					
Information:					
Total Files Size (in bytes):			181588		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15/429,715
	Confirmation Number	5067
	Filing Date	February 10, 2017
	First Named Inventor	Arunabha CHOUDHURY
	Art Unit	2677
	Examiner Name	RILEY, MARCUS T
Attorney Docket Number		Q231458

U.S. PATENTS						
Examiner Initials*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear

U.S. PATENT APPLICATION PUBLICATIONS						
Examiner Initials*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
/MTR/	1.	20080091406	A1	2008-04-17	Baldwin et al.	

FOREIGN PATENT DOCUMENTS								
Examiner Initials*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T ⁵
/MTR/	2.	2015/179510	WO	A1	2015-11-26	Amazon Technologies, Inc.		
/MTR/	3.	2575128	EP	A2	2013-04-03	Apple Inc.		
/MTR/	4.	2015/184186	WO	A1	2015-12-03	Apple Inc.		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
/MTR/	5.	Communication dated January 23, 2019, issued by the European Patent Office in counterpart European Patent Application No. 17750469.3	

EXAMINER SIGNATURE			
Examiner Signature	/MARCUS T RILEY/	Date Considered	02/20/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3).

³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /MTR/

[Page 1 of 2]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15/429,715
	Confirmation Number	5067
	Filing Date	February 10, 2017
	First Named Inventor	Arunabha CHOUDHURY
	Art Unit	2677
	Examiner Name	RILEY, MARCUS T
	Attorney Docket Number	Q231458

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☒ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

- ☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

- ☒ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

- ☐ A certification statement is not submitted herewith.

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Christopher R. Lipp/	Date (YYYY-MM-DD)	2019-02-13
Name/Print	Christopher R. Lipp	Registration Number	41,157

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3).

³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /MTR/

[Page 2 of 2]

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15429715"	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:27
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S3	1	"20140258324"	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:30
S4	3	S1 S2 S3	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:30
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S6	1	"20140317502"	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S7	1	"20140258324"	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S8	3	S5 S6 S7	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S9	2	S8 and (electroni\$4 and devic\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S10	3	S8 and (voice\$4 and process\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
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S19	1	"20140258324"	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
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S23	3	S22 and mobil\$4	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S24	2	S23 and (audio\$4 and microphon\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 15:16
S25	1	"7421390".pn.	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:32
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			PGPUB; USPAT			16:41
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S30	2	S24 and (histor\$8 and stor\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 17:06
S31	0	S24 and (histor\$8 near5 stor\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 17:06
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S36	3623	704/243	US-PGPUB; USPAT	OR	OFF	2018/09/27 20:57
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		stor\$4) and (audio\$4 and microphon\$4)				
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S42	1559	S39 and (histor\$8 and stor\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 20:58
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S44	286	S43 and (voic\$8 near5 command\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 20:59
S45	253	S44 and (application\$8 and context\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:00
S46	118	S45 and semantic\$4	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
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S48	227	S43 and (audio\$8 near5 receiv\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
S49	227	S48 and (audio\$8 near5 receiv\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
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S51	58	S50 and process\$6	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:03
S52	36	S51 and (execut\$8 near5 command\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:04
S53	17	nagaswamy.in.	US-PGPUB; USPAT	OR	OFF	2019/01/04 18:49
S54	1114	choudhury.in.	US-PGPUB; USPAT	OR	OFF	2019/01/04 18:49
S55	1	S53 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and (voic\$4 and mobil\$4) and (histor\$8 and stor\$4) and (audio\$4 and microphon\$4)	US-PGPUB; USPAT	OR	OFF	2019/01/04 18:50
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S62	46064	704/1-504.ccls.	US-PGPUB; USPAT	OR	OFF	2019/01/04 18:54
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S67	786	S66 and (voic\$8 adj command\$4)	US-PGPUB; USPAT	OR	OFF	2019/01/04 18:56
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			USPAT			
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S87	1	"2575128"	EPO	OR	OFF	2019/02/20 14:45
S88	2	"2015184186"	DERWENT	OR	OFF	2019/02/20 14:45
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EAST Search History (I nterference)

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S71	113	704/244	US-PGPUB	OR	OFF	2019/01/04 18:48
S72	238	704/243	US-PGPUB	OR	OFF	2019/01/04 18:48
S73	6867	(G10L15/06 G10L15/18 G10L15/22 G10L15/063 G10L15/1815 G10L15/1822 G10L015/06 G10L015/18 G10L015/22 G10L2015/0635 G10L2015/223 G10L2015/228).cpc.	US-PGPUB	OR	OFF	2019/01/04 18:48
S74	22598	704/1-504.ccls.	US-PGPUB	OR	OFF	2019/01/04 18:48
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S76	13	nagaswamy.in.	US-PGPUB	OR	OFF	2019/01/04 18:49
S77	26614	S71 S72 S73 S74 S75 S76	US-PGPUB	OR	OFF	2019/01/04 18:51
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S81	1	S80 and (histor\$8 and stor\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:53
S82	11	S80 and (audio\$4 and microphon\$4).clm.	US-	OR	OFF	2019/01/04

EAST Search History

			PGPUB			18:53
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2/ 20/ 2019 2:52:01 PM

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15/429,715
	Confirmation Number	5067
	Filing Date	February 10, 2017
	First Named Inventor	Arunabha CHOUDHURY
	Art Unit	2677
	Examiner Name	RILEY, MARCUS T
	Attorney Docket Number	Q231458

U.S. PATENTS						
Examiner Initials*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear

U.S. PATENT APPLICATION PUBLICATIONS						
Examiner Initials*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	20080091406	A1	2008-04-17	Baldwin et al.	

FOREIGN PATENT DOCUMENTS								
Examiner Initials*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T ⁵
	2.	2015/179510	WO	A1	2015-11-26	Amazon Technologies, Inc.		
	3.	2575128	EP	A2	2013-04-03	Apple Inc.		
	4.	2015/184186	WO	A1	2015-12-03	Apple Inc.		

NON-PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	5.	Communication dated January 23, 2019, issued by the European Patent Office in counterpart European Patent Application No. 17750469.3	

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

[Page 1 of 2]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15/429,715
	Confirmation Number	5067
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	First Named Inventor	Arunabha CHOUDHURY
	Art Unit	2677
	Examiner Name	RILEY, MARCUS T
	Attorney Docket Number	Q231458

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
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OR			
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WASHINGTON OFFICE 23373 CUSTOMER NUMBER			
SIGNATURE			
A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.			
Signature	/Christopher R. Lipp/	Date (YYYY-MM-DD)	2019-02-13
Name/Print	Christopher R. Lipp	Registration Number	41,157

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Allowed: January 10, 2019

Appln. No.: 15/429,715

Group Art Unit: 2677

Confirmation No.: 5067

Examiner: RILEY, MARCUS T

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98**

MAIL STOP ISSUE FEE

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

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed after either a Final Office Action, Notice of Allowance, or an action that otherwise closes prosecution in the application (whichever is earlier), but on or before payment of the Issue Fee, and therefore the fee of

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98
Appln. No.: 15/429,715

Attorney Docket No.: Q231458

\$240.00 under 37 C.F.R. § 1.17(p) is being remitted, and a Statement Under 37 C.F.R. § 1.97(e) is being submitted.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

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Respectfully submitted,

/Christopher R. Lipp/

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

Christopher R. Lipp
Registration No. 41,157

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: February 13, 2019

Electronic Patent Application Fee Transmittal				
Application Number:		15429715		
Filing Date:		10-Feb-2017		
Title of Invention:		METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
First Named Inventor/Applicant Name:		Arunabha CHOUDHURY		
Filer:		Christopher Robert Lipp/Tiana Stewart		
Attorney Docket Number:		Q231458		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
Total in USD (\$)				240

Electronic Acknowledgement Receipt	
EFS ID:	35133806
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
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Filer:	Christopher Robert Lipp/Tiana Stewart
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	13-FEB-2019
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Payment information:

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Payment Type	CARD
Payment was successfully received in RAM	\$240
RAM confirmation Number	021419INTEFSW15565300
Deposit Account	194880
Authorized User	Tiana Stewart
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	Q231458RefWO2015179510A1.pdf	1933361	no	38
			4ec56324aa1ec19fd6a66fc359e1bae549116bab		
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2	Foreign Reference	Q231458RefEP2575128A2.pdf	14864103	no	67
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Information:					
3	Foreign Reference	Q231458RefWO2015184186A1.pdf	6137835	no	122
			98f6c648e590a097aab3a5dfe025b5efe7d2acd		
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	Q231458RefEPOA.pdf	1309250	no	8
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Warnings:					
Information:					
5		Q231458IDSasfiled.pdf	277951	yes	5
			0814560aa9513351296c32d41903169f665e1371		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Patent Term Adjustment Stmt Under 37CFR1.704(d)		5	5	
	Information Disclosure Statement (IDS) Form (SB08)		3	4	
	Transmittal Letter		1	2	

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Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30804	no	2
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Warnings:					
Information:					
Total Files Size (in bytes):				24553304	
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14/283,017 20 May 2014 (20.05.2014) US
- (71) Applicant: AMAZON TECHNOLOGIES, INC.
[US/US]; P.O.Box 81226, Seattle, WA 98108-1226 (US).
- (72) Inventors: DI FABBRIZIO, Giuseppe; P.O.Box 81226, Seattle, WA 98108-1226 (US). BHARATHI, Shishir, Sridhar; P.O.Box 81226, Seattle, WA 98108-1226 (US). SHI, Ying; P.O.Box 81226, Seattle, WA 98108-1226 (US). MATHIAS, Lambert; P.O.Box 81226, Seattle, WA 98108-1226 (US).
- (74) Agent: ANDERSON, Maria, Culic; Knobbe Martens Olson & Bear, LLP, 2040 Main Street, 14th Floor, Irvine, CA 92614 (US).

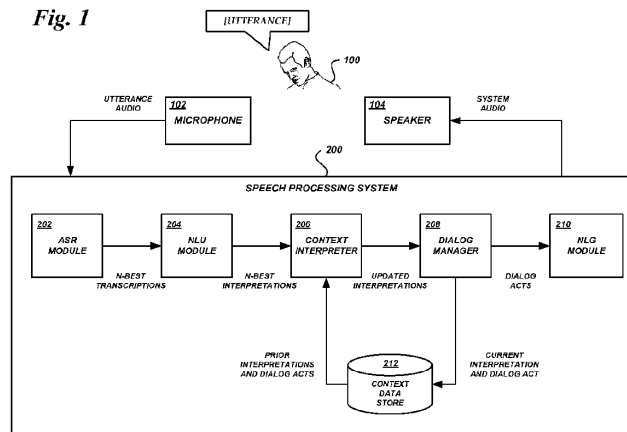
- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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(54) Title: CONTEXT INTERPRETATION IN NATURAL LANGUAGE PROCESSING USING PREVIOUS DIALOG ACTS

Fig. 1



(57) Abstract: Features are disclosed for processing and interpreting natural language, such as interpretations of user utterances, in multi-turn dialog interactions. Context information regarding interpretations of user utterances and system responses to the user utterances can be maintained. Subsequent user utterances can be interpreted using the context information, rather than being interpreted without context. In some cases, interpretations of subsequent user utterances can be merged with interpretations of prior user utterances using a rule-based framework. Rules may be defined to determine which interpretations may be merged and under what circumstances they may be merged.

CONTEXT INTERPRETATION IN NATURAL LANGUAGE PROCESSING USING PREVIOUS DIALOG ACTS

BACKGROUND

[0001] Speech processing systems include various modules and components for receiving spoken input from a user and determining what the user meant. In some implementations, a speech processing system includes an automatic speech recognition (“ASR”) module that receives audio input of a user utterance and generates one or more likely transcriptions of the utterance. ASR modules typically use an acoustic model and a language model. The acoustic model is used to generate hypotheses regarding which words or subword units (e.g., phonemes) correspond to an utterance based on the acoustic features of the utterance. The language model is used to determine which of the hypotheses generated using the acoustic model is the most likely transcription of the utterance based on lexical features of the language in which the utterance is spoken.

[0002] Speech processing systems may also include a natural language understanding (“NLU”) module that receives textual input, such as a transcription of a user utterance, and determines the meaning of the text in a way that can be acted upon, such as by a computer application. For example, an NLU module may be used to determine the meaning of text generated by an ASR module using a statistical language model. The NLU module can then determine the user’s intent from the ASR output and provide the intent to some downstream process that performs some task responsive to the determined intent of the user (e.g., generate a command to initiate the phone call, initiate playback of requested music, provide requested information, etc.).

[0003] Some speech processing systems are configured to engage in multi-turn dialog interactions with users. For example, a user may wish to initiate a certain process or task, but may not provide all necessary information. In this case, the speech processing system can prompt the user for the missing necessary information. As another example, user may wish to receive information from the system. The speech processing system can provide the requested information and allow the user to initiate subsequent processes based on the provided information.

BRIEF DESCRIPTION OF DRAWINGS

[0004] Embodiments of various inventive features will now be described with reference to the following drawings. Throughout the drawings, reference numbers may be used to indicate correspondence between referenced elements. The drawings are provided to illustrate example embodiments described herein and are not intended to limit the scope of the disclosure.

[0005] FIG. 1 is a block diagram of illustrative data flows between modules of a speech processing system during multi-turn dialog utterance processing using contextual information from previous turns.

[0006] FIG. 2 is a block diagram of illustrative data flows between a client device and a speech processing system during utterance processing using a context interpreter.

[0007] FIG. 3 is a block diagram of illustrative data flows between a client device and a speech processing system during utterance processing using a context interpreter.

[0008] FIG. 4 is a flow diagram of an illustrative process for processing an utterance using a context interpreter.

[0009] FIG. 5 is a flow diagram of an illustrative process for determining whether a current utterance interpretation can be merged with a prior utterance interpretation.

DETAILED DESCRIPTION

Introduction

[0010] The present disclosure is directed to enhancing the ability of speech processing systems to naturally engage in—and accurately manage—multi-turn dialog interactions with users (e.g., spoken dialog sessions that include multiple user utterances and/or multiple system responses to accomplish some task). Generally described, the accuracy of speech processing results for multi-turn dialog interactions depends, at least in part, on being able to determine the intent or information conveyed by a user's utterance in the context of previous user-initiated and/or system-initiated interactions of the dialog. When a speech processing system fails to maintain the proper context of the multi-turn dialog interaction, or when a user digresses, makes an utterance regarding an unexpected intent,

utters a sentence fragment, or the like, the speech processing system may not respond accurately to the user's utterance. Some systems use restrictive grammars or highly structured dialogs that only allow specific responses (e.g., prompts eliciting particular information may only be responded to with the elicited information—all other responses are rejected). However, such systems do not allow the natural spoken interactions desired by many users and application developers. Other systems use internal "hints" or other information regarding the expected subject of a future user utterance (e.g., an expected intent or information relevant to an intent). The next user utterance may be processed with a bias toward the expected subject, while still allowing utterances regarding unexpected subjects to be accepted and processed properly. However, such systems may not properly handle a digression from, and return to, an in-process multi-turn dialog interaction, or they may otherwise lose the current context of the multi-turn dialog interaction too often or too quickly.

[0011] Aspects of the present disclosure relate to maintaining a history of turns in a multi-turn dialog interaction (also referred to herein as a "multi-turn interaction" for convenience). In some embodiments, semantic representations of prior user utterances (also referred to herein as "interpretations") and semantic representations of prior system responses and actions (also referred to herein as "dialog acts") can be maintained. By maintaining the semantic representations of prior turns by both the user and the system, the system can refer back to them when interpreting later user utterances in the same multi-turn interaction. For example, the speech processing system can refer back to the interpretation of what a user has said during previous turns of the multi-turn interaction to get additional information or to make decisions about how to respond to a current utterance. The speech processing system can also refer back to what the system itself did in response to those interactions during previous turns of the multi-turn interaction. In this way, the speech processing system can more accurately interpret a current user utterance that relates to some or all prior user utterances and system responses in the multi-turn interaction.

[0012] Advantageously, the ability to access multi-turn interaction context can allow the system to correctly interpret sentence fragments (also referred to herein as "non-sentential utterances" or "NSUs"), digressions, ambiguous intents, and the like. For example,

a multi-turn interaction may include a request to search for flights from a particular departure location to a particular destination location (e.g., “Search for flights from Los Angeles to Chicago.”). One turn of the multi-turn interaction may correspond to an NSU of “in the morning on Friday.” The full meaning of this utterance can be inferred using the multi-turn interaction context. It could be interpreted as “Search for flights from Los Angeles to Chicago in the morning on Friday,” but it may also be interpreted as a return date or something else. If the multi-turn interaction context includes the system prompt “When would you like to return?,” then the proper interpretation of the NSU would be to search for round-trip flights returning in the morning on Friday.

[0013] As used herein, the term “semantic representation” refers to a processed representation of the meaning of a user utterance, or an unambiguous representation of the meaning of a dialog act triggered in response to a user utterance. The semantic representation of a user utterance can be an interpretation of the intent of the user utterance rather than merely a transcription or other lexical representation of the user utterance. For example, if a user has spoken the word “tomorrow,” other words or phrases (e.g., the day of the week, such as “Thursday,” the calendar date, such as the “April 24th, 2014”, etc.) may be equivalent in a semantic sense. If only the string “tomorrow” is saved, then the context may not be useful when subsequent utterances or dialog acts depend on a specific date, etc. Illustratively, the semantic representation of the user utterance may be an instance of a data structure or programmable object generated by an NLU module or component of the speech processing system to store information about the interpretation of the user utterance, such as the domain of the interpretation, the intent represented by the interpretation, information associated with the intent (e.g., values for “slots” of the intent), etc.

[0014] The semantic representation of a system dialog act may be some internal identifier of an action or process to be undertaken by the speech processing system. For example, if the speech processing system elicits additional information from a user (e.g., asking for a travel date in response to a plane ticket search request), the semantic representation of that dialog act may be the code, name, signature, or other identifier (and related information) that is processed by the speech processing system into a user-understandable prompt (e.g., synthesized speech or a visual display). In some embodiments,

the semantic representation of the dialog act may be a data structure or programmable object generated by a dialog manager or some other component of the speech processing system to store information about the dialog act, such as the domain of the dialog act, the action represented by the interpretation (e.g., elicitation of information, confirmation of intent, etc.), information associated with a determined intent (e.g., “slots”), etc.

[0015] Additional aspects of the present disclosure relate to a rule-based approach to interpreting the context (semantic representations of prior user and system turns) in multi-turn interactions. The rule-based approach can improve natural language understanding accuracy by providing a framework in which to interpret a current user utterance in view of prior interpretations and dialog acts saved as described above. In some embodiments, the rules may define or otherwise facilitate determination of which dialog acts to trigger in response to user utterances, depending upon which previous utterances the user has made and/or which dialog acts have been previously triggered in the current multi-turn interaction. For example, if a user initiates a search for plane tickets, the user may provide certain information relevant to the search (e.g., a travel date, airline, and departure location). The system may prompt the user for a destination, and the user may digress by asking about the weather in various locations. In this scenario, the user may expect previous work done to search for plane tickets (e.g., specifying the travel date, airline, and departure location) to be maintained by the system, and the user may simply provide a destination responsive to the system elicitation of destination information. By storing semantic representations of prior utterances and dialog acts, the speech processing system can gracefully handle this utterance that provides a destination by, e.g., merging it with previously provided information into a fully-formed intent and corresponding slot values.

[0016] Further aspects of the present disclosure relate to re-scoring or otherwise re-ranking speech processing results (e.g., NLU results) based on the stored contextual information. In some embodiments, an NLU module or component may generate an *n*-best list of the top *n* interpretations (where *n* is some non-negative integer) of a particular user utterance. Rather than using the rules described above and in greater detail below to process only the top-scoring interpretation or to select only one interpretation that satisfies a rule, the interpretations in the *n*-best list may be filtered, re-scored or re-ranked based on the

application of the rules. For example, if a particular interpretation in the n -best list is merged with a prior interpretation, the combined merged interpretation may be inserted into the n -best list and may be given a score that is higher or otherwise indicates more relevance than the un-merged intent alone. Re-ranking can help to reduce or prevent the chance that the speech processing system will use any interpretation that satisfies a rule, even if the interpretation is associated with a low recognition confidence. Instead, the true “correct” result may be maintained in an n -best list of results, and may therefore be recognized correctly.

[0017] Although aspects of the embodiments described in the disclosure will focus, for the purpose of illustration, on a distributed system in which user utterances are received by a client device and audio data is transmitted to a separate network-based speech processing system for processing, one skilled in the art will appreciate that the techniques disclosed herein may be applied to any number of software processes or applications performing speech processing. For example, a user device may include some or all of the modules, components, or other functionality to process speech and maintain context. In addition, although aspects of the embodiments described herein will focus, for the purpose of illustration, on speech recognition performed on user utterances, the inventions are not so limited. In some embodiments, the context interpretation systems and techniques may be applied to natural language input of any kind. For example, user-supplied text or other non-verbal input may be processed. In such cases, the speech processing system may be replaced by, or supplemented with, a more general natural language processing system. Various aspects of the disclosure will now be described with regard to certain examples and embodiments, which are intended to illustrate but not limit the disclosure.

Example Speech Processing System with a Context Interpreter

[0018] With reference to an illustrative embodiment, FIG. 1 shows a speech processing system that may implement aspects of the present disclosure. In particular, FIG. 1 shows example data flows between various speech and language processing modules in response to receipt of user utterances. A user 100 may make an utterance, such as an utterance that includes a spoken command for a computing system to perform some task. In

one specific non-limiting example, the user 100 may say “Search for flights departing from Los Angeles next Friday.” The user 100 may speak the utterance into (or in the presence of) some client device operated by the user.

[0019] The client device (e.g., client device 300 shown in FIGS. 2 and 3) can correspond to a wide variety of electronic devices. In some embodiments, the client device may be a computing device that includes one or more processors and a memory which may contain software applications executed by the processors. The client device may include or be in communication with an audio input component for accepting speech input on which to perform speech recognition, such as a microphone 102. The client device may also include or be in communication with an output component for presenting responses or other information from the speech processing system 200, such as a speaker 104. The software of the client device may include hardware components and/or software for establishing communications over wireless communication networks or directly with other computing devices. Illustratively, the client device may be a mobile device, such as a mobile phone, personal digital assistant (“PDA”), mobile gaming device, media player, electronic book reader, tablet computer, laptop computer, or the like. In some embodiments, the client device may be a substantially stationary device, such as a television with program execution capabilities and network connectivity (a “smart TV”), set-top box, gaming console, home entertainment system, desktop computer, server computer, or the like.

[0020] As shown in FIG. 1, user utterances may be provided to a speech processing system 200. The speech processing system 200 can be a network-accessible system in communication with the client device via a communication network, such as a cellular telephone network or the Internet. A user may use the client device to submit utterances, receive information, and initiate various processes, either on the client device or at the speech processing system 200. For example, the user can issue spoken commands to the client device in order to search for plane tickets as described above, set timers, listen to music, initiate phone calls, etc.

[0021] The speech processing system 200 may include an ASR module 202 that performs automatic speech recognition on audio data regarding user utterances, an NLU module 204 that performs natural language understanding on transcriptions generated by the

ASR module 202, a context interpreter 206 which applies contextual rules to current NLU results based on prior interpretations and dialog acts, a dialog manager 208 that manages user interaction with the speech processing system 200 and initiates various dialog acts, a natural language generation (“NLG”) module that converts certain dialog acts into user-understandable communications (e.g., text that can be “read” to the user by a text-to-speech or “TTS” component), and a context data store 212 for storing semantic representations of previous user utterances and system dialog acts.

[0022] The speech processing system 200 may include any number of server computing devices, desktop computing devices, mainframe computers, and the like. Each individual device may implement one of the modules or components of the speech processing system 200. In some embodiments, the speech processing system 200 can include several devices physically or logically grouped together to implement one of the modules or components of the speech processing system 200. For example, the speech processing system 200 can include various modules and components combined on a single device, multiple instances of a single module or component, etc. In one specific, non-limiting embodiment, the speech processing system 200 may include a server or group of servers configured with ASR and/or NLU modules 202, 204, a server or group of servers configured with a context interpreter 206 and/or a dialog manager 208, etc. In multi-device implementations, the various devices of the speech processing system 200 may communicate via an internal communication network, such as a corporate or university network configured as a local area network (“LAN”) or a wide area network (“WAN”). In some cases, the devices of the speech processing system 200 may communicate over an external network, such as the Internet, or a combination of internal and external networks.

[0023] In some embodiments, the features and services provided by the speech processing system 200 may be implemented as web services consumable via a communication network. In further embodiments, the speech processing system 200 is provided by one or more virtual machines implemented in a hosted computing environment. The hosted computing environment may include one or more rapidly provisioned and released computing resources, which computing resources may include computing,

networking and/or storage devices. A hosted computing environment may also be referred to as a cloud computing environment.

[0024] In some embodiments, the features of the speech processing system 200 may be integrated into the client device such that network connection and one or more separate computing systems are not necessary to perform the processes of the present disclosure. For example, a single client device may include the microphone 102, the ASR module 202, the NLU module 204, the dialog manager 206, the skip list 208, or some combination thereof.

[0025] Returning to the examples described above and in greater detail below, users may submit utterances that may include various commands, requests, and the like. The microphone 102 may capture utterance audio and provide it (or data derived therefrom) to the speech processing system 200. The ASR module 202 may generate ASR results for the utterance, such as an *n*-best list of transcriptions. Each transcription or portion thereof may be associated with some score, such as a confidence score or a likelihood that the transcription or portion thereof is correct. The *n*-best list or some other type of results may be provided to the NLU module 204 so that the user's intent may be determined. An *n*-best list of interpretations (e.g., intents) may be determined or generated by the NLU module 204 and provided to the context interpreter 206. The context interpreter 206 can process the NLU results (e.g., modify individual interpretations, filter interpretations, re-score or re-rank interpretations, etc.) as described in greater detail below, and provide processed results to the dialog manager 206. Illustratively, the context interpreter 206 may merge a current NLU result with a prior result that was stored in the context data store 212 based on the application of a context interpretation rule. The dialog manager 208 may then generate a response (e.g., a confirmation) based on the merged result, and the NLG module 210 can translate the semantic response generated by the dialog manager 208 into human-readable text, synthesized speech, etc. The semantic response generated by the dialog manager 208 can be stored in the context data store 212, along with semantic representations of prior responses, user utterances, and the like.

Example Multi-Turn Interactions Processed using a Context Interpreter

[0026] FIGS. 2 and 3 illustrate example interactions between a client device 300 and a speech processing system 200 during multi-turn interactions. During a multi-turn interaction, the speech processing system 200 and a user of the client device 300 can each take turns and exchange one or more utterances to achieve some goal, such as finding a song, buying music, booking a flight, etc. As described above, each user utterance can be represented by an interpretation (a semantic representation of the meaning of a user utterance, or some portion thereof), and each system communication can be represented by a dialog act (a semantic representation of the meaning of a system prompt, or some portion thereof).

[0027] The examples illustrated in FIGS. 2 and 3 (and other examples herein) are described with reference to particular dialog acts for illustration purposes only. The dialog acts described herein are not exhaustive of every dialog act that may be implemented by a speech processing system. In some embodiments, dialog acts may be categorized into four main types: (1) explicit confirmation of a slot value or intent; (2) implicit confirmation of a slot value or intent; (3) elicitation of a slot value; and (4) disambiguation of a slot value or intent.

[0028] For example, the system may explicitly confirm the value of a particular slot or the correctness of a particular intent when it has low confidence in its interpretation, when acting on the intent will cost money or be difficult to reverse, etc. The system can formulate a yes/no question (e.g., “You’d like to purchase the song ‘Fly Me to the Moon,’ right?”). The user can confirm or reject the slot value (e.g., the value of “Fly Me to the Moon” for the “Song-Title” slot of a “Purchase-Song” intent) or the intent itself.

[0029] As another example, the system may implicitly confirm the value of a slot or the correctness of an intent by presenting a prompt in the form of a statement (e.g., “Now playing ‘Fly Me to the Moon’ by Frank Sinatra”). The user may decide to correct a wrongly interpreted input by replying with a sentence fragment (e.g., “No, ‘My Way’”), which is typically interpreted by the speech processing system as a non-sentential utterance (“NSU”) with a specific slot value but without a corresponding intent.

[0030] As a further example, the system may be missing a slot value that is required in order to take action on a particular intent. The system may elicit a value for the

missing slot with an explicit question (e.g., “Which song?”). In this case, the user is expected to utter a sentence fragment, which is typically classified as an NSU with a specific slot value.

[0031] As a still further example, the system may be unable to confidently determine into which of two or more slots a particular value is to be placed, or to which of two or more intents a user is referring. The system can elicit user disambiguation with an explicit question (e.g., “Did you mean the album or the song?”). In this case, the user is expected to utter a sentence fragment, which is typically classified as an NSU with a specific slot name or intent name.

[0032] With reference to FIG. 2, an example of a user digression or unexpected intent will be described. Advantageously, interpreting current utterances within the context of prior turns in a multi-turn interaction can help a speech processing system understand that a current utterance relates to a previous dialog act, such as an elicitation of information by the system, even when one or more intervening turns of the multi-turn interaction do not relate to the previous dialog act. In a system that does not maintain and use multi-turn context in this way, such intervening user digressions or unexpected intents may cause the system to misinterpret or fail to interpret an otherwise relevant and responsive utterance by a user (e.g., the system may “forget” that the previous dialog act was generated).

[0033] As shown in FIG. 2, a user may make a first utterance of a multi-turn interaction, which is transmitted by the client device 300 to the speech processing system 200 at [1]. Illustratively, the utterance may be “Search for flights departing from Los Angeles next Friday.” The speech processing system 200 can process the utterance using the ASR module 202 and NLU module 204 as described above. The dialog manager 208 can store a semantic representation of the utterance (e.g., “Search-Flights-Intent(Departure-Date=4/23/2014; Departure-Location=LAX)”) in the context data store 212, and generate a dialog act responsive to the utterance (e.g., “Elicit-Information(Destination-Location)”). The NLG module 210 may generate a user prompt based on the dialog act (e.g., “What is your destination?”), and the prompt may be provided to client device 300 at [2] for presentation to the user.

[0034] Rather than responding to the elicitation, the user may digress or make some unexpected or non-responsive utterance. For example, the user may say “What is the weather like in Chicago?” The client device 300 can provide the digression to the speech processing system 200 at [3]. The speech processing system 200 may generate preliminary speech processing results (e.g., an *n*-best list of interpretations of the utterance, as described above), and the preliminary results may be provided to the content interpreter 206. The context interpreter 206 may process the results as described in greater detail below with respect to FIGS. 4 and 5. For example, one of the *n*-best interpretations of the utterance may be that the utterance is a fully formed intent for requesting weather in a location. Because no prior dialog act or interpretation in the context data store 212 relates to that intent, the context interpreter 206 may not modify the interpretation. As another example, a second interpretation of the *n*-best list may be that the utterance is an NSU providing a value for a “Destination-Location” slot. Because the context data store 212 includes a prior dialog act eliciting that particular slot value, the interpretation may be merged with the prior interpretation (also in the context data store 212) of “Search-Flights-Intent(...)” in order to provide a missing slot value. This merged interpretation may be inserted into the *n*-best list. However, the first interpretation in the *n*-best list (e.g., the fully formed weather location intent) may be associated with a score indicating that the system 200 has a higher confidence in the correctness of that interpretation than the merged interpretation. The first interpretation can be acted upon by the dialog manager 208 (e.g., to generate a dialog act to provide the weather at the requested location) and by the NLG module 210 to provide a response to the client device 300 at [4]. In addition, the chosen interpretation and generated dialog act can be stored in the context data store 212.

[0035] The user may subsequently make an utterance that is related to the initial turns of this illustrative multi-turn interaction. For example, the user may decide to continue searching for flights by providing the information previously elicited by the system 200 at [2]. The user may say “Chicago” (or “Go to Chicago,” or “Let’s try Chicago,” or “Destination Chicago,” etc.), and the client device 300 can provide the utterance to the speech processing system 200 at [5].

[0036] The speech processing system 200 can again generate preliminary speech processing results for the current utterance. One of the top-scoring results may be an interpretation that the utterance is an NSU providing a value for a “Destination-Location” slot. Because the context data store 212 includes a prior dialog act eliciting that particular slot value, the interpretation may be merged with the prior interpretation (also in the context data store 212) of “Search-Flights-Intent(...)” in order to provide the missing value for the “Destination-Location” slot. This time, the interpretation may be associated with a score indicating that the interpretation is likely the correct interpretation based on the lack of a higher scoring interpretation that is not merged (e.g., because the utterance was an NSU, there was no higher-scoring interpretation of a fully formed intent, as was the case when the user made the weather-related utterance at [3]). The dialog manager 208 can receive the merged interpretation with the fully formed “Search-Flights-Intent(...),” and can initiate the requested action (e.g., by providing instructions to an application module configured to execute flight searches). The dialog manager 208 can produce a dialog act responsive to the intent, and the NLG module 210 can produce a response that is sent to the client device 300 at [6]. Illustratively, the response may be the results of the flight search, a confirmation of the intent (e.g., “Searching for flights to Chicago . . .”), elicitation of additional information (e.g., “When would you like to return?”), etc.

[0037] The interactions between the client device 300 and speech processing system 200 may continue after dialog act #4 at [6]. For example, the user may make a subsequent utterance that relates to the digression previously made by the user at [3]. The speech processing system 200 may use the context interpreter 206 as described above and in greater detail below to interpret the subsequent utterance in view of previous utterances and dialog acts, including the digression. In this case, the subsequent utterance can be merged with the digression and acted upon.

[0038] With reference to FIG. 3, an example of a potentially ambiguous intent that is interpreted using multi-turn interaction context will be described. Advantageously, interpreting current utterances within the context of prior turns in a multi-turn interaction can help solve ambiguities without requiring additional user input, and can help avoid initiating an incorrect action based on an interpretation of an utterance in isolation when the correct

action is determinable in the context of the entire multi-turn interaction (or some portion thereof).

[0039] As shown in FIG. 3, a user may make a first utterance of a multi-turn interaction, which is transmitted by the client device 300 to the speech processing system 200 at [1]. Illustratively, the utterance may be “Play internet radio.” The speech processing system 200 can process the utterance using the ASR module 202 and NLU module 204 as described above. The dialog manager 208 can store a semantic representation of the utterance (e.g., “Play-Internet-Radio-Station-Intent(...)”) in the context data store 212, and generate a dialog act responsive to the utterance (e.g., “Elicit-Information(Radio-Station)”). The NLG module 210 may generate a user prompt based on the dialog act (e.g., “Which internet radio station?”), and the prompt may be provided to client device 300 at [2] for presentation to the user.

[0040] The user may respond to the elicitation with a potentially ambiguous utterance. For example, the user may say “Play Frank Sinatra.” In isolation, that utterance may typically indicate that the user wishes to hear music by Frank Sinatra that the user owns (e.g., the utterance may be interpreted as “Play-Music-Intent(Artist=’Frank Sinatra’)”). However, in the present example, the user wishes to hear the “Frank Sinatra” internet radio station (e.g., properly interpreted as “Play-Internet-Radio-Intent(Station=’Frank Sinatra’)”), rather than music that the user owns. A system that interprets user utterances without access to the context of prior multi-turn interactions may determine that the utterance “Play Frank Sinatra” reflects a new user intent rather than a response to an elicitation of information regarding a prior user intent. Accordingly, such a system would begin playback of music that the user owns. In contrast, the context interpreter 206 of the speech processing system 200 can access prior interpretations of user utterances and prior dialog acts for this multi-turn interaction, and determine that the utterance “Play Frank Sinatra” was made in response to an elicitation for the name of an internet radio station. The context interpreter can therefore properly merge an interpretation of the user utterance (e.g., an NLU result indicating that the utterance is an NSU including a value for the “Station” slot) into the previously stored Play-Internet-Radio-Intent(...). A response can then be generated and provided to the client device 300 at [4]. Illustratively, the response may be a stream of the requested internet radio

station, a confirmation of the intent (e.g., “Playing the Frank Sinatra station”), elicitation of additional information, etc.

Process for Interpreting Utterances Using Multi-Turn Interaction Context

[0041] With reference now to FIG. 4, a sample process 400 for processing a user utterance using multi-turn interaction context will be described. Advantageously, a context interpreter 206 or some other module or component of a speech processing system 200 performing the process 400 can modify individual speech processing results using a rule-based analysis of previous interpretations of user intent and previous dialog acts generated responsive to those intents. Such processing based on the context of the multi-turn interaction can allow more natural communication with a speech processing system and more robust dialog management without loss of context.

[0042] The process 400 begins at block 402. The process 400 may begin automatically upon receipt of input data (e.g., an *n*-best list of interpretations of a current user utterance) by a context interpreter 206 or some other module or component of a speech processing system 200. The process 400 may be embodied in a set of executable program instructions stored on a computer-readable medium, such as one or more disk drives, of a computing system of the speech processing system 200. When the process 400 is initiated, the executable program instructions can be loaded into memory, such as RAM, and executed by one or more processors of the computing system.

[0043] At block 404, the content interpreter 206 or some other module or component of the speech processing system 200 can obtain a list of interpretations of the current user utterance. Returning to the example illustrated in FIG. 3 and described above, the context interpreter 206 may receive an *n*-best list of interpretations for utterance #2, “Play Frank Sinatra.” The *n*-best list may include a top-ranked interpretation of the user utterance as an intent to play Frank Sinatra music that the user owns (Play-Music-Intent(Artist=’Frank Sinatra’)). The *n*-best list may include a lower-ranked interpretation of the user utterance as an NSU with a slot value of “Frank Sinatra” for a “Radio-Station” slot.

[0044] At block 406, the content interpreter 206 or some other module or component of the speech processing system 200 can iterate through each of the *n*-best results

(or some subset thereof) to determine whether any particular result may be modified or merged with a previous intent. As described below, the determination can be a rule-based determination using contextual information regarding interpretations of previous user utterances and previously generated dialog acts in the present multi-turn interaction.

[0045] At decision block 408, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether a particular interpretation is able to be merged with a previously stored interpretation. One example rule-based process for determining whether an interpretation may be merged with a previously stored interpretation is illustrated in FIG. 5 and described in detail below. If the interpretation may be merged, the process 400 proceeds to block 410 where the interpretations can be merged. Otherwise, the process 400 proceeds to decision block 412, where it is determined whether there are additional interpretation results for the present utterance to analyze.

[0046] In some embodiments, a single interpretation of the current utterance can be merged with multiple (e.g., two or more) previously stored interpretations. For example, if an interpretation of the current utterance and each of multiple prior interpretations satisfy the rule-based framework shown in FIG. 5, then the interpretation may be merged with each of those prior interpretations and used as candidate results to be added to an *n*-best of interpretations.

[0047] Once the relevant interpretations have been processed using the context of the multi-turn interaction, the interpretations can be filtered, re-scored, or re-ranked at block 414 and provided to a downstream consumer of the interpretations, such as a dialog manager 208. For example, all un-merged NSUs may be filtered from the results. As another example, a merged interpretation may be given a score corresponding to the score of the previous interpretation with which a current interpretation was merged. In some embodiments, a context interpreter 206 may employ a machine learning model to re-score and/or re-rank the interpretations. For example, the features used by the machine learning model may include ASR results and/or scores for the current and any number of prior utterances; NLU results and/or scores for the current and any number of prior utterances; any number of previous dialog acts; etc. The model may then be used to provide a ranking or

score for the results to be provided to downstream consumers of the interpretations. The process 400 can terminate at block 416.

[0048] FIG. 5 illustrates a sample process 500 for determining whether an interpretation may be merged with a previously stored interpretation. The process 500 begins at block 502. In some embodiments, the process 500 may begin automatically upon entry of decision block 408 in process 400 described above. The process 500 may be embodied in a set of executable program instructions stored on a computer-readable medium, such as one or more disk drives, of a computing system of the speech processing system 200. When the process 500 is initiated, the executable program instructions can be loaded into memory, such as RAM, and executed by one or more processors of the computing system. In some embodiments, the process 500 may be a subroutine of process 400, rather than a separate process embodied in a separate set of program instructions.

[0049] At block 504, the content interpreter 206 or some other module or component of the speech processing system 200 can iterate through each dialog act of the multi-turn interaction, or some subset thereof (e.g., only the previous 1 or 2 dialog acts) to determine whether the interpretation that is currently being considered may be modified or merged with a previous intent.

[0050] At decision block 506, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether the dialog act for the current iteration is an elicitation of information or a confirmation. If not, the process 500 can proceed to decision block 518, where it can be determined whether to iterate through any other prior dialog acts using the process 500. However, if the dialog act of the current iteration is indeed an elicitation or confirmation, the process 500 can proceed to decision block 508. Returning to the examples above, elicitation dialog acts were initiated at turn [2] of both FIGS. 2 and 3. In FIG. 2, the elicitation was for a destination name to fill a slot in a flight search intent. In FIG. 3, the elicitation was for a radio station name to fill a slot in an internet radio intent.

[0051] At decision block 508, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether the dialog act for the current iteration is in the same domain as the interpretation that is currently being considered.

Generally described, a domain may correspond to a particular topic or subject, or to multiple (e.g., two or more) related topics and/or subjects. The meaning of a particular word or phrase may vary, depending upon the domain in which the word or phrase is used. If the dialog act of the current iteration is in the same domain as the interpretation that is currently being considered, the process 500 can proceed to decision block 510.

[0052] At decision block 510, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether the dialog act for the current iteration relates to a target slot. In the examples above, the elicitation dialog acts are related to target slots because they are eliciting values for those slots. The dialog acts at turn [6] in FIG. 2 and at turn [4] in FIG. 3 may relate to target slots if they are confirming values of particular slots. In these cases, the process may proceed to decision block 512. However, if those dialog acts are confirming intents or providing requested information (e.g., a listing of flights, playback of a radio station), then the dialog acts do not relate to target slots. In these cases, the process 500 may proceed to decision block 514.

[0053] At decision block 512, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether the interpretation currently being considered provides an acceptance, rejection, or replacement value for the target slot. If so, then the interpretation is able to be merged with a previous interpretation in the context of the multi-turn interaction—namely, the previous interpretation for which the dialog act of the current iteration of the process 500 was generated.

[0054] At decision block 514, the content interpreter 206 or some other module or component of the speech processing system 200 can determine whether the interpretation currently being considered provides an acceptance, rejection, or replacement value of a value in a previous interpretation in the context of the multi-turn interaction—namely, the previous interpretation for which the dialog act of the current iteration of the process 500 was generated. If so, then the interpretation is able to be merged with that previous interpretation.

Additional Embodiments

[0055] In some embodiments, statistical models may be used to determine whether interpretations can be merged with prior interpretations, rather than a set of rules as

described above. For example, the probability that a particular interpretation within a multi-turn interaction context is correct can be determined using conditional random fields (“CRFs”), maximum entropy-based statistical classifiers, etc., or some combination thereof. One challenge when using such probabilistic methods is that a corpus of annotated training data is needed in order to train the models. Such data may be difficult to obtain or generate because it involves multi-turn interactions in which the sequence of the interactions is important, rather than simply a collection of discrete interactions. Therefore, a bootstrap approach may be used in order to obtain a sufficient amount of training data. For example, interaction data may be collected using the rule-based approach described above until a sufficient amount of training data is obtained, and then statistical models may be generated and used in place of (or in combination with) the rule framework.

Terminology

[0056] Depending on the embodiment, certain acts, events, or functions of any of the processes or algorithms described herein can be performed in a different sequence, can be added, merged, or left out altogether (e.g., not all described operations or events are necessary for the practice of the algorithm). Moreover, in certain embodiments, operations or events can be performed concurrently, e.g., through multi-threaded processing, interrupt processing, or multiple processors or processor cores or on other parallel architectures, rather than sequentially.

[0057] The various illustrative logical blocks, modules, routines, and algorithm steps described in connection with the embodiments disclosed herein can be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware, or as software that runs on hardware, depends upon the particular application and design constraints imposed on the overall system. The described functionality can be implemented in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the disclosure.

[0058] Moreover, the various illustrative logical blocks and modules described in connection with the embodiments disclosed herein can be implemented or performed by a machine, such as a general purpose processor device, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor device can be a microprocessor, but in the alternative, the processor device can be a controller, microcontroller, or state machine, combinations of the same, or the like. A processor device can include electrical circuitry configured to process computer-executable instructions. In another embodiment, a processor device includes an FPGA or other programmable device that performs logic operations without processing computer-executable instructions. A processor device can also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. Although described herein primarily with respect to digital technology, a processor device may also include primarily analog components. For example, some or all of the signal processing algorithms described herein may be implemented in analog circuitry or mixed analog and digital circuitry. A computing environment can include any type of computer system, including, but not limited to, a computer system based on a microprocessor, a mainframe computer, a digital signal processor, a portable computing device, a device controller, or a computational engine within an appliance, to name a few.

[0059] The elements of a method, process, routine, or algorithm described in connection with the embodiments disclosed herein can be embodied directly in hardware, in a software module executed by a processor device, or in a combination of the two. A software module can reside in RAM memory, flash memory, ROM memory, EPROM memory, EEPROM memory, registers, hard disk, a removable disk, a CD-ROM, or any other form of a non-transitory computer-readable storage medium. An exemplary storage medium can be coupled to the processor device such that the processor device can read information from, and write information to, the storage medium. In the alternative, the storage medium can be integral to the processor device. The processor device and the storage medium can reside in

an ASIC. The ASIC can reside in a user terminal. In the alternative, the processor device and the storage medium can reside as discrete components in a user terminal.

[0060] Conditional language used herein, such as, among others, "can," "could," "might," "may," "e.g.," and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or steps. Thus, such conditional language is not generally intended to imply that features, elements and/or steps are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without other input or prompting, whether these features, elements and/or steps are included or are to be performed in any particular embodiment. The terms "comprising," "including," "having," and the like are synonymous and are used inclusively, in an open-ended fashion, and do not exclude additional elements, features, acts, operations, and so forth. Also, the term "or" is used in its inclusive sense (and not in its exclusive sense) so that when used, for example, to connect a list of elements, the term "or" means one, some, or all of the elements in the list.

[0061] Disjunctive language such as the phrase "at least one of X, Y, Z," unless specifically stated otherwise, is otherwise understood with the context as used in general to present that an item, term, etc., may be either X, Y, or Z, or any combination thereof (e.g., X, Y, and/or Z). Thus, such disjunctive language is not generally intended to, and should not, imply that certain embodiments require at least one of X, at least one of Y, or at least one of Z to each be present.

[0062] While the above detailed description has shown, described, and pointed out novel features as applied to various embodiments, it can be understood that various omissions, substitutions, and changes in the form and details of the devices or algorithms illustrated can be made without departing from the spirit of the disclosure. As can be recognized, certain embodiments described herein can be embodied within a form that does not provide all of the features and benefits set forth herein, as some features can be used or practiced separately from others. The scope of certain embodiments disclosed herein is indicated by the appended claims rather than by the foregoing description. All changes which

come within the meaning and range of equivalency of the claims are to be embraced within their scope.

[0063] The foregoing may also be understood in view of the following clauses:

1. A system comprising:

a computer-readable memory storing executable instructions; and

one or more processors in communication with the computer-readable memory, wherein the one or more processors are programmed by the executable instructions to at least:

obtain first audio data regarding a first utterance of a user;

generate first speech processing results based at least partly on the first audio data, the first speech processing results comprising a semantic representation of the first utterance;

generate a first response for presentation to the user based at least partly on the first speech processing results;

store context information comprising the semantic representation of the first utterance and a semantic representation of the first response;

obtain second audio data regarding a second utterance of the user;

generate second speech processing results using the second audio data, the context information, and a context interpretation rule, wherein the context interpretation rule relates to replacing at least one of a slot value or an intent of the semantic representation of the first utterance with at least one of a slot value or an intent of a semantic representation of the second utterance, and wherein the context rule is based at least partly on the semantic representation of the first response; and

generate a second response for presentation to the user based at least partly on the second speech processing results.

2. The system of clause 1, wherein the semantic representation of the first utterance comprises an intent and one or more slots associated with the intent.

3. The system of clause 1, wherein the one or more processors are further programmed to generate intervening speech processing results for an intervening user utterance subsequent to storing the context information associated with the first utterance and prior to generating the second speech processing results for the second user utterance.

4. A computer-implemented method comprising:
under control of one or more computing devices configured with specific computer-executable instructions,

storing context information associated with a first natural language input and a first response to the first natural language input, wherein the context information comprises a semantic representation of the first natural language input and a semantic representation of the first response to the natural language input;

generating natural language processing results for a second natural language input based at least partly on the context information, wherein the natural language processing results comprise at least a portion of a semantic representation of the second natural language input merged with the semantic representation of the first natural language input; and

generating a second response to the second natural language input based at least partly on the natural language processing results.

5. The computer-implemented method of clause 4, wherein the natural language input comprises text or speech.

6. The computer-implemented method of clause 4, wherein the semantic representation of the second natural language input is merged with the semantic representation of the first natural language input by replacing a slot value of the semantic representation of the first natural language input with a slot value of the semantic representation of the second natural language input.

7. The computer-implemented method of clause 4, wherein the semantic representation of the second natural language input is merged with the semantic representation of the first natural language input by replacing an intent of the semantic representation of the first natural language input with an intent of the semantic representation of the second natural language input.

8. The computer-implemented method of clause 4, wherein the natural language processing results for the second natural language input are generated based at least partly on a context interpretation rule.

9. The computer-implemented method of clause 8, wherein the context interpretation rule relates to determining whether a domain of the semantic representation of the first natural language input is equivalent to a domain of the semantic representation of the second natural language input.

10. The computer-implemented method of clause 8, wherein the context interpretation rule relates to determining whether at least one of an intent or a slot associated with the semantic representation of the first natural language input is equivalent to at least one of an intent or a slot associated with the semantic representation of the second natural language input.

11. The computer-implemented method of clause 8, wherein the context interpretation rule relates to the semantic representation of the first response to the first natural language input.

12. The computer-implemented method of clause 11, wherein the context interpretation rule further relates to determining whether the semantic representation of the first response to the first natural language input corresponds to an elicitation of information associated with the semantic representation of the first natural language input.

13. The computer-implemented method of clause 11, wherein the context interpretation rule further relates to determining whether the semantic representation of the first response to the first natural language input corresponds to a confirmation of information associated with the semantic representation of the first natural language input.

14. The computer-implemented method of clause 4, further comprising re-ranking at least a portion of the second natural language processing results.

15. The computer-implemented method of clause 4, further comprising filtering at least a portion of the second natural language processing results.

16. Non-transitory computer-readable storage comprising executable code that, when executed, causes one or more computing devices to perform a process comprising:

storing context information associated with a first natural language input and a first response to the first natural language input, wherein the context information comprises a semantic representation of the first natural language input and a semantic representation of the first response to the natural language input;

generating natural language processing results for a second natural language input based at least partly on the context information, wherein the natural language processing results comprise at least a portion of a semantic representation of the second natural language input merged with the semantic representation of the first natural language input; and

generating a second response to the second natural language input based at least partly on the natural language processing results.

17. The non-transitory computer-readable storage of clause 16, wherein the natural language input comprises text or speech.

18. The non-transitory computer-readable storage of clause 16, wherein the semantic representation of the second natural language input is merged with the semantic representation of the first natural language input by replacing at least one of a slot value or an intent of the semantic representation of the first natural language input with at least one of a slot value or an intent of the semantic representation of the second natural language input.

19. The non-transitory computer-readable storage of clause 16, the process further comprising determining whether a domain of the semantic representation of the first natural language input is equivalent to a domain of the semantic representation of the second natural language input.

20. The non-transitory computer-readable storage of clause 16, the process further comprising determining whether at least one of an intent or a slot associated with the semantic representation of the first natural language input is equivalent to at least one of an intent or a slot associated with the semantic representation of the second natural language input.

21. The non-transitory computer-readable storage of clause 16, the process further comprising determining whether the semantic representation of the first response to the first natural language input corresponds to an elicitation of information associated with the semantic representation of the first natural language input.

22. The non-transitory computer-readable storage of clause 16, the process further comprising determining whether the semantic representation of the first response to the first natural language input corresponds to a confirmation of information associated with the semantic representation of the first natural language input.

23. The non-transitory computer-readable storage of clause 16, the process further comprising one of re-ranking or filtering at least a portion of the second natural language processing results.

24. The non-transitory computer-readable storage of clause 16, the process further comprising generating intervening natural language processing results for an intervening natural language input subsequent to storing the context information associated with the first natural language input and prior to generating the natural language processing results for the second natural language input.

25. The non-transitory computer-readable storage of clause 24, wherein first natural language input and the second natural language input are associated with a first intent, and wherein the intervening natural language input is associated with a second intent that is different than the first intent.

CLAIMS

WHAT IS CLAIMED IS:

1. A system comprising:
 - a computer-readable memory storing executable instructions; and
 - one or more processors in communication with the computer-readable memory, wherein the one or more processors are programmed by the executable instructions to at least:
 - obtain first audio data regarding a first utterance of a user;
 - generate first speech processing results based at least partly on the first audio data, the first speech processing results comprising a semantic representation of the first utterance;
 - generate a first response for presentation to the user based at least partly on the first speech processing results;
 - store context information comprising the semantic representation of the first utterance and a semantic representation of the first response;
 - obtain second audio data regarding a second utterance of the user;
 - generate second speech processing results using the second audio data, the context information, and a context interpretation rule, wherein the context interpretation rule relates to replacing at least one of a slot value or an intent of the semantic representation of the first utterance with at least one of a slot value or an intent of a semantic representation of the second utterance, and wherein the context rule is based at least partly on the semantic representation of the first response; and
 - generate a second response for presentation to the user based at least partly on the second speech processing results.
2. The system of claim 1, wherein the semantic representation of the first utterance comprises an intent and one or more slots associated with the intent.

3. The system of claim 1, wherein the one or more processors are further programmed to generate intervening speech processing results for an intervening user utterance subsequent to storing the context information associated with the first utterance and prior to generating the second speech processing results for the second user utterance.

4. A computer-implemented method comprising:
under control of one or more computing devices configured with specific computer-executable instructions,

storing context information associated with a first natural language input and a first response to the first natural language input, wherein the context information comprises a semantic representation of the first natural language input and a semantic representation of the first response to the natural language input;

generating natural language processing results for a second natural language input based at least partly on the context information, wherein the natural language processing results comprise at least a portion of a semantic representation of the second natural language input merged with the semantic representation of the first natural language input; and

generating a second response to the second natural language input based at least partly on the natural language processing results.

5. The computer-implemented method of claim 4, wherein the natural language input comprises text or speech.

6. The computer-implemented method of claim 4, wherein the semantic representation of the second natural language input is merged with the semantic representation of the first natural language input by replacing a slot value of the semantic representation of the first natural language input with a slot value of the semantic representation of the second natural language input.

7. The computer-implemented method of claim 4, wherein the semantic representation of the second natural language input is merged with the semantic representation of the first natural language input by replacing an intent of the semantic representation of the first natural language input with an intent of the semantic representation of the second natural language input.

8. The computer-implemented method of claim 4, wherein the natural language processing results for the second natural language input are generated based at least partly on a context interpretation rule.

9. The computer-implemented method of claim 8, wherein the context interpretation rule relates to determining whether a domain of the semantic representation of the first natural language input is equivalent to a domain of the semantic representation of the second natural language input.

10. The computer-implemented method of claim 8, wherein the context interpretation rule relates to determining whether at least one of an intent or a slot associated with the semantic representation of the first natural language input is equivalent to at least one of an intent or a slot associated with the semantic representation of the second natural language input.

11. The computer-implemented method of claim 8, wherein the context interpretation rule relates to the semantic representation of the first response to the first natural language input.

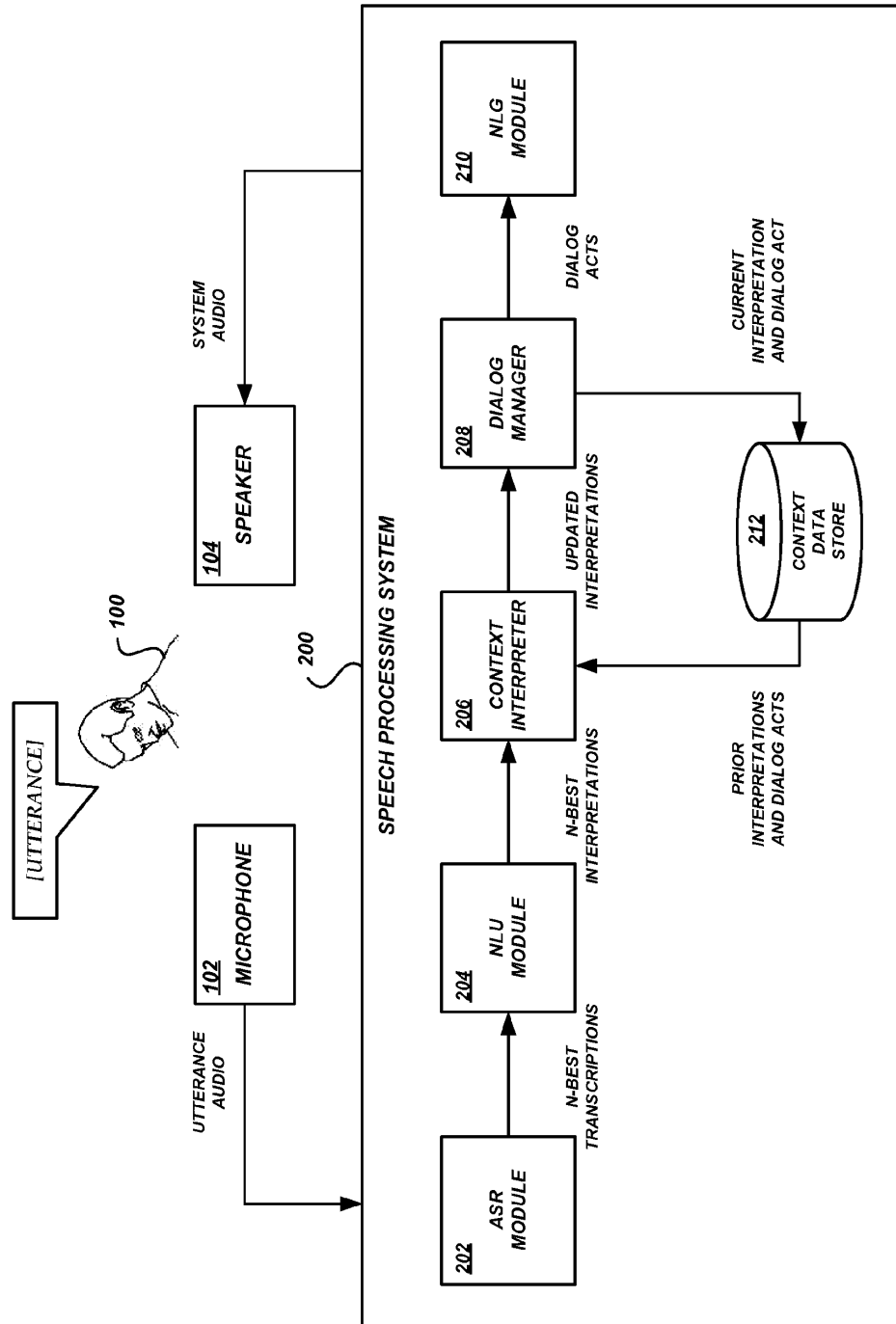
12. The computer-implemented method of claim 11, wherein the context interpretation rule further relates to determining whether the semantic representation of the first response to the first natural language input corresponds to an elicitation of information associated with the semantic representation of the first natural language input.

13. The computer-implemented method of claim 11, wherein the context interpretation rule further relates to determining whether the semantic representation of the first response to the first natural language input corresponds to a confirmation of information associated with the semantic representation of the first natural language input.

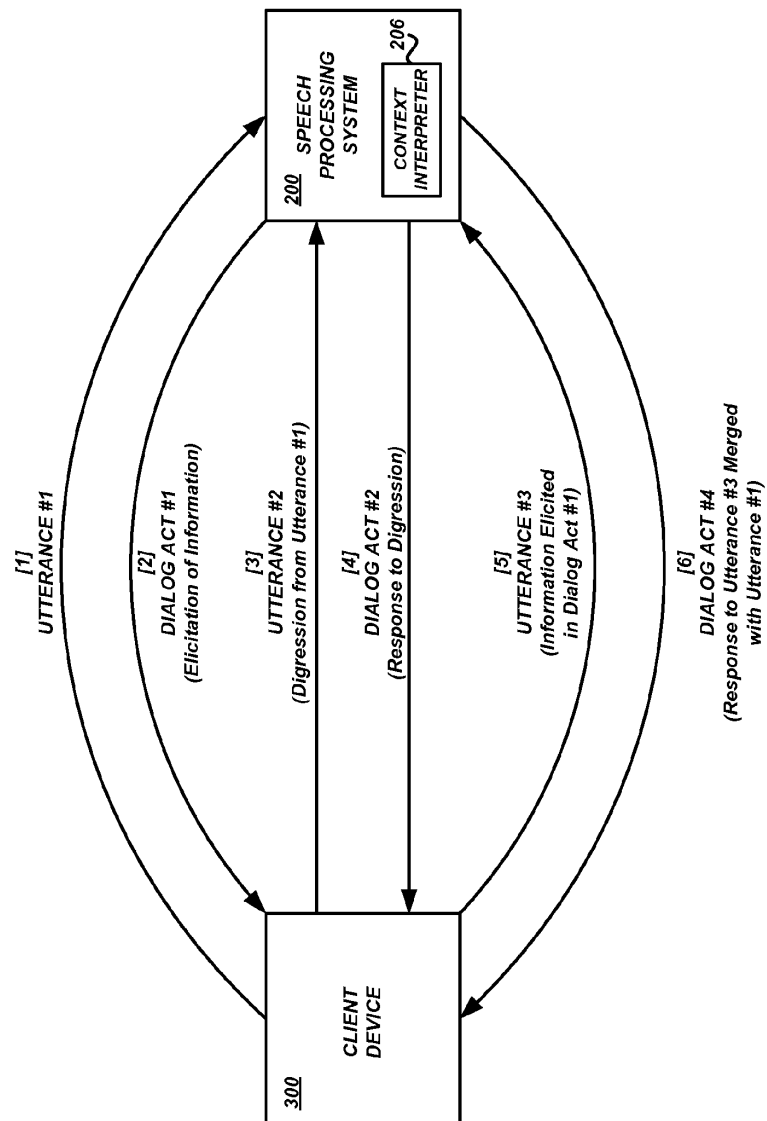
14. The computer-implemented method of claim 4, further comprising re-ranking at least a portion of the second natural language processing results.

15. The computer-implemented method of claim 4, further comprising filtering at least a portion of the second natural language processing results.

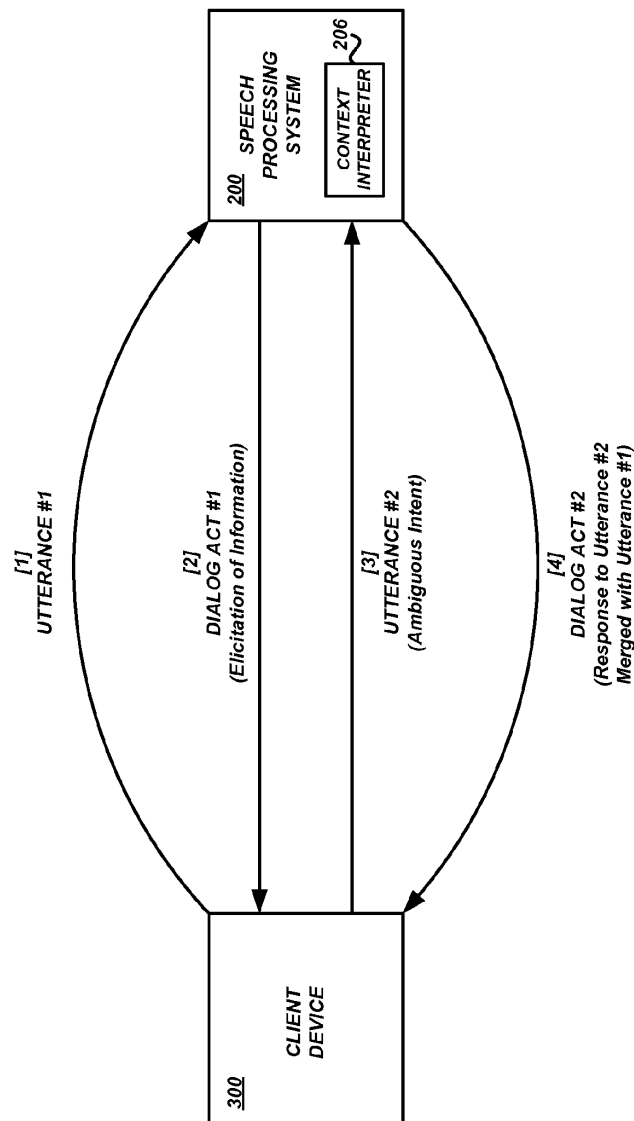
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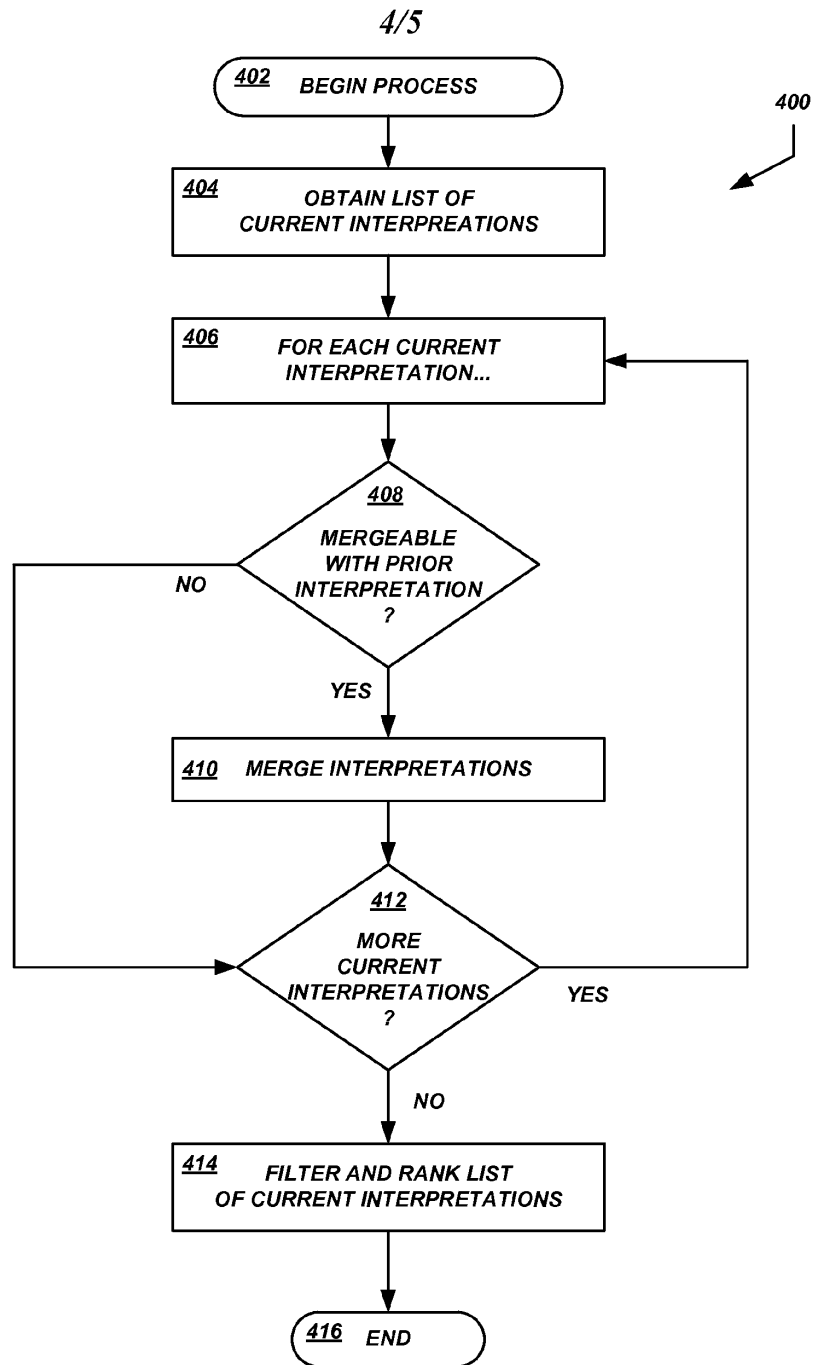
*Fig. 1*

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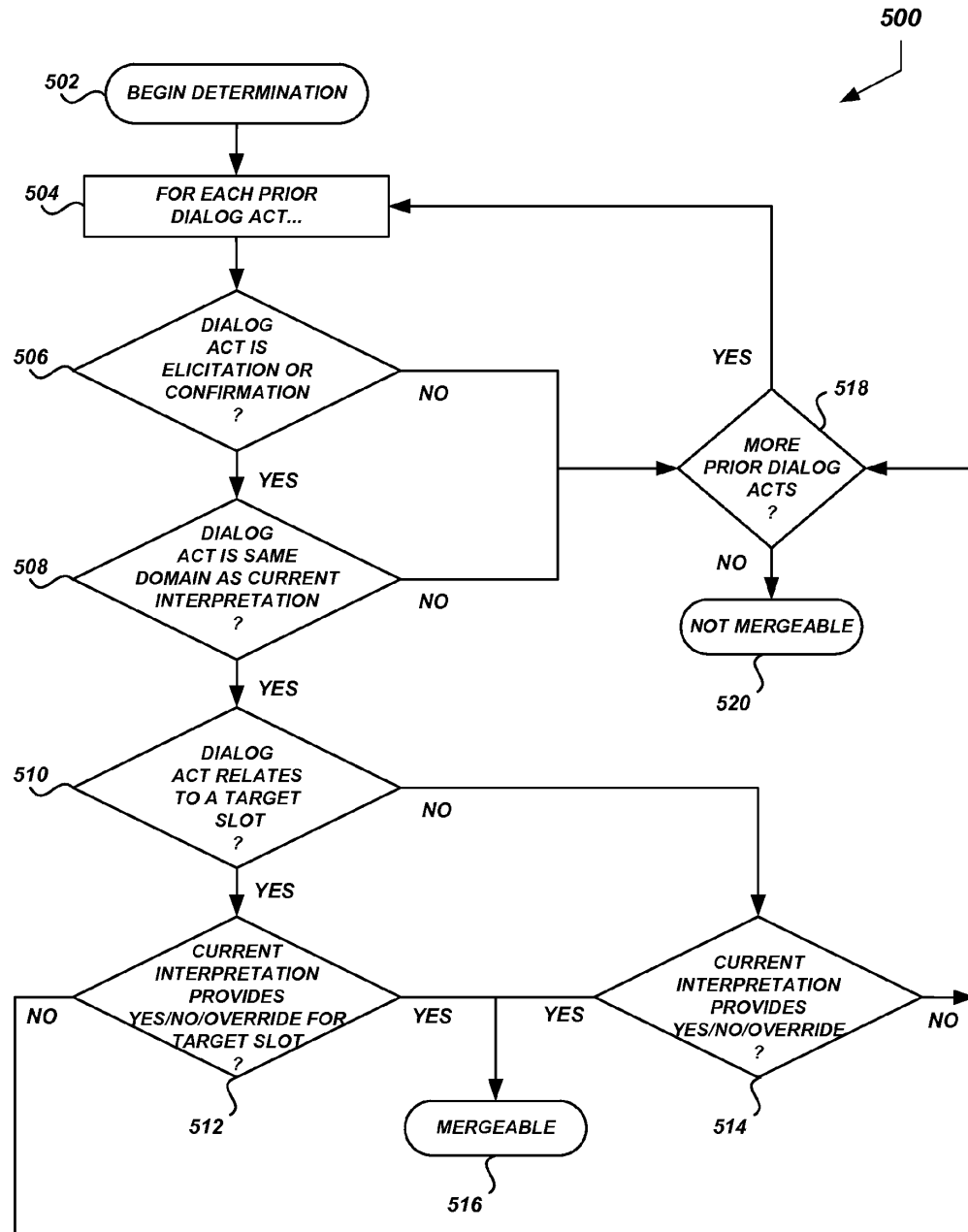
**Fig. 2**

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**Fig. 3**



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**Fig. 5**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/031765

A. CLASSIFICATION OF SUBJECT MATTER INV. G10L15/22 ADD. G10L15/18 G10L15/30 According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) G10L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 2008/091406 A1 (BALDWIN LARRY [US] ET AL) 17 April 2008 (2008-04-17) paragraphs [0017], [0032], [0034], [0035] paragraphs [0036] - [0039] paragraphs [0047], [0051] paragraph [0055] -----	1-15		
X	US 2007/174057 A1 (GENLY CHRISTOPHER H [US]) 26 July 2007 (2007-07-26) paragraphs [0091], [0095] paragraphs [0030], [0031], [0032], [0036], [0038] paragraphs [0047], [0048] paragraphs [0062] - [0089] paragraph [0050] ----- - / - -	1-15		
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.				
* Special categories of cited documents : <table border="0"> <tr> <td> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search 7 July 2015		Date of mailing of the international search report 15/07/2015		
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer: Ramos Sánchez, U		

Form PCT/ISA/210 (second sheet) (April 2005)

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/031765

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 2006/037219 A1 (INAGO CORP [CA]; DICARLANTONIO RON [JP]; LEONARD HUW [CA]; FARMANER GA) 13 April 2006 (2006-04-13) paragraphs [0023], [0043], [0044] paragraphs [0048] - [0050] paragraphs [0061] - [0065] paragraphs [0073], [0078], [0080] paragraphs [0084] - [0088] paragraphs [0098] - [0099] -----	1-15
A	EP 2 575 128 A2 (APPLE INC [US]) 3 April 2013 (2013-04-03) paragraphs [0115] - [0117] paragraphs [0162] - [0171] paragraphs [0176] - [0184] -----	1-15

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/031765

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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(19)



(11)

EP 2 575 128 A2

(12)

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• Keen, Dan

Sunnyvale, CA California 95086 (US)

• Brigham, Christopher

San Jose, CA California 95112PH 3 (US)

• Novick, Gregory

Cupertino, CA California CA95014 (US)

• Phipps, Benjamin

Cupertino, CA California CA95014 (US)

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(71) Applicant: **Apple Inc.**

Cupertino, CA 95014 (US)

(74) Representative: **Barton, Russell Glen**

Withers & Rogers LLP

4 More London Riverside

London

SE1 2AU (GB)

(72) Inventors:

• Gruber, Thomas

Cupertino, CA California 94062 (US)

(54) **Using context information to facilitate processing of commands in a virtual assistant**

(57) A virtual assistant uses context information to supplement natural language or gestural input from a user. Context helps to clarify the user's intent and to reduce the number of candidate interpretations of the user's input, and reduces the need for the user to provide excessive clarification input. Context can include any available information that is usable by the assistant to supplement

explicit user input to constrain an information-processing problem and/or to personalize results. Context can be used to constrain solutions during various phases of processing, including, for example, speech recognition, natural language processing, task flow processing, and dialog generation.

EP 2 575 128 A2

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Description**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority as a continuation-in-part of U.S. Utility Application Serial No. 12/479,477, entitled "Contextual Voice Commands", attorney docket number P7393US1, filed June 5, 2009, the entire disclosure of which is incorporated herein by reference.

[0002] This application further claims priority as a continuation-in-part of U.S. Utility Application Serial No. 12/987,982, entitled "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference.

[0003] U.S. Utility Application Serial No. 12/987,982 claims priority from U.S. Provisional Patent Application Serial No. 61/295,774, entitled "Intelligent Automated Assistant", attorney docket number SIRIP003P, filed January 18, 2010, the entire disclosure of which is incorporated herein by reference.

[0004] This application further claims priority from U.S. Provisional Application Serial No. 61/493,201, entitled "Generating and Processing Data Items That Represent Tasks to Perform", attorney docket number P11337P1, filed June 3, 2011, the entire disclosure of which is incorporated herein by reference.

[0005] This application is related to U.S. Utility Application Serial No. ___, entitled "Generating and Processing Task Items that Represent Tasks to Perform", attorney docket number P11337US1, filed on the same date as the present application, the entire disclosure of which is incorporated herein by reference.

[0006] This application is related to U.S. Utility Application Serial No. ___, entitled "Automatically Adapting User Interfaces for Hands-Free Interaction", attorney docket number P11357US1, filed on the same date as the present application, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0007] The present invention relates to virtual assistants, and more specifically to mechanisms for improving interpretation and processing of commands provided to such an assistant.

BACKGROUND OF THE INVENTION

[0008] Today's electronic devices are able to access a large, growing, and diverse quantity of functions, services, and information, both via the Internet and from other sources. Functionality for such devices is increasing rapidly, as many consumer devices, smartphones, tablet computers, and the like, are able to run software applications to perform various tasks and provide different types of information. Often, each application, function,

website, or feature has its own user interface and its own operational paradigms, many of which can be burdensome to learn or overwhelming for users. In addition, many users may have difficulty even discovering what functionality and/or information is available on their electronic devices or on various websites; thus, such users may become frustrated or overwhelmed, or may simply be unable to use the resources available to them in an effective manner.

[0009] In particular, novice users, or individuals who are impaired or disabled in some manner, and/or are elderly, busy, distracted, and/or operating a vehicle may have difficulty interfacing with their electronic devices effectively, and/or engaging online services effectively. Such users are particularly likely to have difficulty with the large number of diverse and inconsistent functions, applications, and websites that may be available for their use.

[0010] Accordingly, existing systems are often difficult to use and to navigate, and often present users with inconsistent and overwhelming interfaces that often prevent the users from making effective use of the technology.

[0011] An intelligent automated assistant, also referred to herein as a virtual assistant, can provide an improved interface between human and computer. Such an assistant, which may be implemented as described in related U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference, allows users to interact with a device or system using natural language, in spoken and/or text forms. Such an assistant interprets user inputs, operationalizes the user's intent into tasks and parameters to those tasks, executes services to support those tasks, and produces output that is intelligible to the user.

[0012] A virtual assistant can draw on any of a number of sources of information to process user input, including for example knowledge bases, models, and/or data. In many cases, the user's input alone is not sufficient to clearly define the user's intent and task to be performed. This could be due to noise in the input stream, individual differences among users, and/or the inherent ambiguity of natural language. For example, the user of a text messaging application on a phone might invoke a virtual assistant and speak the command "call her". While such a command is perfectly reasonable English, it is not a precise, executable statement, since there are many interpretations and possible solutions to this request. Thus, without further information, a virtual assistant may not be able to correctly interpret and process such input. Ambiguity of this type can lead to errors, incorrect actions being performed, and/or excessively burdening the user with requests to clarify input.

SUMMARY

[0013] According to various embodiments of the present invention, a virtual assistant uses context information (also referred to herein as "context") to supplement natural language or gestural input from a user. This helps to clarify the user's intent and to reduce the number of candidate interpretations of the user's input, and reduces the need for the user to provide excessive clarification input. Context can include any available information that is usable by the assistant to supplement explicit user input to constrain an information-processing problem and/or to personalize results. For example, if input from the user includes a pronoun (such as "her" in the command "call her") the virtual assistant can use context to infer the referent of the pronoun, for example to ascertain the identity of the person to be called and/or the telephone number to use. Other uses of context are described herein.

[0014] According to various embodiments of the present invention, any of a number of mechanisms can be implemented for acquiring and applying contextual information to perform computations in a virtual assistant implemented on an electronic device. In various embodiments, the virtual assistant is an intelligent automated assistant as described in U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference. Such an assistant engages with the user in an integrated, conversational manner using natural language dialog, and invokes external services when appropriate to obtain information or perform various actions. According to the techniques described herein, contextual information is used in such an assistant, for example, to reduce ambiguity when performing information processing functions such as speech recognition, natural language processing, task flow processing, and dialog generation.

[0015] According to various embodiments of the present invention, a virtual assistant may be configured, designed, and/or operable to use context in performing various different types of operations, functionalities, and/or features, and/or to combine a plurality of features, operations, and applications of an electronic device on which it is installed. In some embodiments, a virtual assistant of the present invention can use context when performing any or all of: actively eliciting input from a user, interpreting user intent, disambiguating among competing interpretations, requesting and receiving clarifying information as needed, and/or performing (or initiating) actions based on the discerned intent.

[0016] Actions can be performed, for example, by activating and/or interfacing with any applications or services that may be available on an electronic device, as well as services that are available over an electronic network such as the Internet. In various embodiments, such activation of external services can be performed via ap-

plication programming interfaces (APIs) or by any other suitable mechanism. In this manner, a virtual assistant implemented according to various embodiments of the present invention can unify, simplify, and improve the user's experience with respect to many different applications and functions of an electronic device, and with respect to services that may be available over the Internet. The user can thereby be relieved of the burden of learning what functionality may be available on the device and on web-connected services, how to interface with such services to get what he or she wants, and how to interpret the output received from such services; rather, the assistant of the present invention can act as a go-between between the user and such diverse services.

[0017] In addition, in various embodiments, the virtual assistant of the present invention provides a conversational interface that the user may find more intuitive and less burdensome than conventional graphical user interfaces. The user can engage in a form of conversational dialog with the assistant using any of a number of available input and output mechanisms, such as for example speech, graphical user interfaces (buttons and links), text entry, and the like. The system can be implemented using any of a number of different platforms, such as device APIs, the web, email, and the like, or any combination thereof. Requests for additional input can be presented to the user in the context of such a conversation. Short and long term memory can be engaged so that user input can be interpreted in proper context given previous events and communications within a given session, as well as historical and profile information about the user.

[0018] In addition, in various embodiments, context information derived from user interaction with a feature, operation, or application on a device can be used to streamline the operation of other features, operations, or applications on the device or on other devices. For example, the virtual assistant can use the context of a phone call (such as the person called) to streamline the initiation of a text message (for example to determine that the text message should be sent to the same person, without the user having to explicitly specify the recipient of the text message). The virtual assistant of the present invention can thereby interpret instructions such as "send him a text message", wherein the "him" is interpreted according to context information derived from a current phone call, and/or from any feature, operation, or application on the device. In various embodiments, the virtual assistant takes into account various types of available context data to determine which address book contact to use, which contact data to use, which telephone number to use for the contact, and the like, so that the user need not re-specify such information manually.

[0019] Contextual information sources include, for example and without limitation: the current state of a device used as an interface to the assistant, such as the current time, location, application, or data object; personal data such as a user's address book, calendar, and application usage history; and the state of the dialog between the

user and the virtual assistant, such as recently mentioned people and/or places.

[0020] Context can be applied to a variety of computations and inferences in the operation of the virtual assistant. For example, context can be used to reduce ambiguity or otherwise constrain the number of solutions as user input is processed. Context can thus be used to constrain the solutions during various phases of processing, including for example and without limitation:

- **Speech Recognition** - receiving voice input and generating candidate interpretations in text, for example, "call her", "collar", and "call Herb". Context can be used to constrain which words and phrases are considered by a speech recognition module, how they are ranked, and which are accepted as above a threshold for consideration. For example, the user's address book can add personal names to an otherwise language-general model of speech, so that these names can be recognized and given priority.
- **Natural Language Processing (NLP)** - parsing text and associating the words with syntactic and semantic roles, for example, determining that the user input is about making a phone call to a person referred to by the pronoun "her", and finding a specific data representation for this person. For example, the context of a text messaging application can help constrain the interpretation of "her" to mean "the person with whom I am conversing in text."
- **Task Flow Processing** - identifying a user task, task steps, and task parameters used to assist with the task, for example, which phone number to use for the person referred to as "her". Again, the context of the text messaging application can constrain the interpretation of the phone number to indicate that the system should use the number currently or recently used for a text messaging conversation.
- **Dialog Generation** - generating assistant responses as part of a conversation with the user about their task, for example, to paraphrase the user's intent with the response "OK, I'll call Rebecca on her mobile..." The level of verbosity and informal tone are choices that can be guided by contextual information.

[0021] In various embodiments, the virtual assistant of the present invention can control various features and operations of an electronic device. For example, the virtual assistant can call services that interface with functionality and applications on a device via APIs or by other means, to perform functions and operations that might otherwise be initiated using a conventional user interface on the device. Such functions and operations may include, for example, setting an alarm, making a telephone call, sending a text message or email message, adding a calendar event, and the like. Such functions and oper-

ations may be performed as add-on functions in the context of a conversational dialog between a user and the assistant. Such functions and operations can be specified by the user in the context of such a dialog, or they may be automatically performed based on the context of the dialog. One skilled in the art will recognize that the assistant can thereby be used as a control mechanism for initiating and controlling various operations on the electronic device, which may be used as an alternative to conventional mechanisms such as buttons or graphical user interfaces. As described herein, contextual information can be used to inform and improve on such use of the virtual assistant as a control mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings illustrate several embodiments of the invention and, together with the description, serve to explain the principles of the invention according to the embodiments. One skilled in the art will recognize that the particular embodiments illustrated in the drawings are merely exemplary, and are not intended to limit the scope of the present invention.

[0023] Fig. 1 is a block diagram depicting a virtual assistant and some examples of sources of context that can influence its operation according to one embodiment.

[0024] Fig. 2 is a flow diagram depicting a method for using context at various stages of processing in a virtual assistant, according to one embodiment.

[0025] Fig. 3 is a flow diagram depicting a method for using context in speech elicitation and interpretation, according to one embodiment.

[0026] Fig. 4 is a flow diagram depicting a method for using context in natural language processing, according to one embodiment.

[0027] Fig. 5 is a flow diagram depicting a method for using context in task flow processing, according to one embodiment.

[0028] Fig. 6 is a block diagram depicting an example of sources of context distributed between a client and server, according to one embodiment.

[0029] Figs. 7a through 7d are event diagrams depicting examples of mechanisms for obtaining and coordinating context information according to various embodiments.

[0030] Figs. 8a through 8d depict examples of various representations of context information as can be used in connection with various embodiments of the present invention.

[0031] Fig. 9 depicts an example of a configuration table specifying communication and caching policies for various contextual information sources, according to one embodiment.

[0032] Fig. 10 is an event diagram depicting an example of accessing the context information sources configured in Fig. 9 during the processing of an interaction sequence, according to one embodiment.

[0033] Figs. 11 through 13 are a series of screen shots

depicting an example of the use of application context in a text messaging domain to derive a referent for a pronoun, according to one embodiment.

[0034] Fig. 14 is a screen shot illustrating a virtual assistant prompting for name disambiguation, according to one embodiment.

[0035] Fig. 15 is a screen shot illustrating a virtual assistant using dialog context to infer the location for a command, according to one embodiment.

[0036] Fig. 16 is a screen shot depicting an example of the use of a telephone favorites list as a source of context, according to one embodiment.

[0037] Figs. 17 through 20 are a series of screen shots depicting an example of the use of current application context to interpret and operationalize a command, according to one embodiment.

[0038] Fig. 21 is a screen shot depicting an example of the use of current application context to interpret a command that invokes a different application.

[0039] Figs. 22 through 24 are a series of screen shots depicting an example of the use of event context in the form of an incoming text message, according to one embodiment.

[0040] Figs. 25A and 25B are a series of screen shots depicting an example of the use of prior dialog context, according to one embodiment.

[0041] Fig. 26A and 26B are screen shots depicting an example of a user interface for selecting among candidate interpretations, according to one embodiment.

[0042] Fig. 27 is a block diagram depicting an example of one embodiment of a virtual assistant system.

[0043] Fig. 28 is a block diagram depicting a computing device suitable for implementing at least a portion of a virtual assistant according to at least one embodiment.

[0044] Fig. 29 is a block diagram depicting an architecture for implementing at least a portion of a virtual assistant on a standalone computing system, according to at least one embodiment.

[0045] Fig. 30 is a block diagram depicting an architecture for implementing at least a portion of a virtual assistant on a distributed computing network, according to at least one embodiment.

[0046] Fig. 31 is a block diagram depicting a system architecture illustrating several different types of clients and modes of operation.

[0047] Fig. 32 is a block diagram depicting a client and a server, which communicate with each other to implement the present invention according to one embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0048] According to various embodiments of the present invention, a variety of contextual information is acquired and applied to perform information processing functions in support of the operations of a virtual assistant. For purposes of the description, the term "virtual assistant" is equivalent to the term "intelligent automated

assistant", both referring to any information processing system that performs one or more of the functions of:

- interpreting human language input, in spoken and/or text form;
- operationalizing a representation of user intent into a form that can be executed, such as a representation of a task with steps and/or parameters;
- executing task representations, by invoking programs, methods, services, APIs, or the like; and
- generating output responses to the user in language and/or graphical form.

[0049] An example of such a virtual assistant is described in related U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference.

[0050] Various techniques will now be described in detail with reference to example embodiments as illustrated in the accompanying drawings. In the following description, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects and/or features described or reference herein. It will be apparent, however, to one skilled in the art, that one or more aspects and/or features described or reference herein may be practiced without some or all of these specific details. In other instances, well known process steps and/or structures have not been described in detail in order to not obscure some of the aspects and/or features described or reference herein.

[0051] One or more different inventions may be described in the present application. Further, for one or more of the invention(s) described herein, numerous embodiments may be described in this patent application, and are presented for illustrative purposes only. The described embodiments are not intended to be limiting in any sense. One or more of the invention(s) may be widely applicable to numerous embodiments, as is readily apparent from the disclosure. These embodiments are described in sufficient detail to enable those skilled in the art to practice one or more of the invention(s), and it is to be understood that other embodiments may be utilized and that structural, logical, software, electrical and other changes may be made without departing from the scope of the one or more of the invention(s). Accordingly, those skilled in the art will recognize that the one or more of the invention(s) may be practiced with various modifications and alterations. Particular features of one or more of the invention(s) may be described with reference to one or more particular embodiments or figures that form a part of the present disclosure, and in which are shown, by way of illustration, specific embodiments of one or more of the invention(s). It should be understood, however, that such features are not limited to usage in the one or more particular embodiments or figures with reference to which they are described. The present disclosure

sure is neither a literal description of all embodiments of one or more of the invention(s) nor a listing of features of one or more of the invention(s) that must be present in all embodiments.

[0052] Headings of sections provided in this patent application and the title of this patent application are for convenience only, and are not to be taken as limiting the disclosure in any way.

[0053] Devices that are in communication with each other need not be in continuous communication with each other, unless expressly specified otherwise. In addition, devices that are in communication with each other may communicate directly or indirectly through one or more intermediaries.

[0054] A description of an embodiment with several components in communication with each other does not imply that all such components are required. To the contrary, a variety of optional components are described to illustrate the wide variety of possible embodiments of one or more of the invention(s).

[0055] Further, although process steps, method steps, algorithms or the like may be described in a sequential order, such processes, methods and algorithms may be configured to work in any suitable order. In other words, any sequence or order of steps that may be described in this patent application does not, in and of itself, indicate a requirement that the steps be performed in that order. Further, some steps may be performed simultaneously despite being described or implied as occurring non-simultaneously (e.g., because one step is described after the other step). Moreover, the illustration of a process by its depiction in a drawing does not imply that the illustrated process is exclusive of other variations and modifications thereto, does not imply that the illustrated process or any of its steps are necessary to one or more of the invention(s), and does not imply that the illustrated process is preferred.

[0056] When a single device or article is described, it will be readily apparent that more than one device/article (whether or not they cooperate) may be used in place of a single device/article. Similarly, where more than one device or article is described (whether or not they cooperate), it will be readily apparent that a single device/article may be used in place of the more than one device or article.

[0057] The functionality and/or the features of a device may be alternatively embodied by one or more other devices that are not explicitly described as having such functionality/features. Thus, other embodiments of one or more of the invention(s) need not include the device itself.

[0058] Techniques and mechanisms described or reference herein will sometimes be described in singular form for clarity. However, it should be noted that particular embodiments include multiple iterations of a technique or multiple instantiations of a mechanism unless noted otherwise.

[0059] Although described within the context of tech-

nology for implementing an intelligent automated assistant, also known as a virtual assistant, it may be understood that the various aspects and techniques described herein may also be deployed and/or applied in other fields of technology involving human and/or computerized interaction with software.

[0060] Other aspects relating to virtual assistant technology (e.g., which may be utilized by, provided by, and/or implemented at one or more virtual assistant system embodiments described herein) are disclosed in one or more of the following, the entire disclosures of which are incorporated herein by reference:

- U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011;
- U.S. Provisional Patent Application Serial No. 61/295,774 for "Intelligent Automated Assistant", attorney docket number SIRIP003P, filed January 18, 2010;
- U.S. Patent Application Serial No. 11/518,292 for "Method And Apparatus for Building an Intelligent Automated Assistant", filed September 8, 2006; and
- U.S. Provisional Patent Application Serial No. 61/186,414 for "System and Method for Semantic Auto-Completion", filed June 12, 2009.

Hardware Architecture

[0061] Generally, the virtual assistant techniques disclosed herein may be implemented on hardware or a combination of software and hardware. For example, they may be implemented in an operating system kernel, in a separate user process, in a library package bound into network applications, on a specially constructed machine, and/or on a network interface card. In a specific embodiment, the techniques disclosed herein may be implemented in software such as an operating system or in an application running on an operating system.

[0062] Software/hardware hybrid implementation(s) of at least some of the virtual assistant embodiment(s) disclosed herein may be implemented on a programmable machine selectively activated or reconfigured by a computer program stored in memory. Such network devices may have multiple network interfaces which may be configured or designed to utilize different types of network communication protocols. A general architecture for some of these machines may appear from the descriptions disclosed herein. According to specific embodiments, at least some of the features and/or functionalities of the various virtual assistant embodiments disclosed herein may be implemented on one or more general-purpose network host machines such as an end-user computer system, computer, network server or server system, mobile computing device (e.g., personal digital assistant, mobile phone, smartphone, laptop, tablet computer, or the like), consumer electronic device, music player, or any other suitable electronic device, router,

switch, or the like, or any combination thereof. In at least some embodiments, at least some of the features and/or functionalities of the various virtual assistant embodiments disclosed herein may be implemented in one or more virtualized computing environments (e.g., network computing clouds, or the like).

[0063] Referring now to Fig. 28, there is shown a block diagram depicting a computing device 60 suitable for implementing at least a portion of the virtual assistant features and/or functionalities disclosed herein. Computing device 60 may be, for example, an end-user computer system, network server or server system, mobile computing device (e.g., personal digital assistant, mobile phone, smartphone, laptop, tablet computer, or the like), consumer electronic device, music player, or any other suitable electronic device, or any combination or portion thereof. Computing device 60 may be adapted to communicate with other computing devices, such as clients and/or servers, over a communications network such as the Internet, using known protocols for such communication, whether wireless or wired.

[0064] In one embodiment, computing device 60 includes central processing unit (CPU) 62, interfaces 68, and a bus 67 (such as a peripheral component interconnect (PCI) bus). When acting under the control of appropriate software or firmware, CPU 62 may be responsible for implementing specific functions associated with the functions of a specifically configured computing device or machine. For example, in at least one embodiment, a user's personal digital assistant (PDA) or smartphone may be configured or designed to function as a virtual assistant system utilizing CPU 62, memory 61, 65, and interface(s) 68. In at least one embodiment, the CPU 62 may be caused to perform one or more of the different types of virtual assistant functions and/or operations under the control of software modules/components, which for example, may include an operating system and any appropriate applications software, drivers, and the like.

[0065] CPU 62 may include one or more processor(s) 63 such as, for example, a processor from the Motorola or Intel family of microprocessors or the MIPS family of microprocessors. In some embodiments, processor(s) 63 may include specially designed hardware (e.g., application-specific integrated circuits (ASICs), electrically erasable programmable read-only memories (EEPROMs), field-programmable gate arrays (FPGAs), and the like) for controlling the operations of computing device 60. In a specific embodiment, a memory 61 (such as non-volatile random access memory (RAM) and/or read-only memory (ROM)) also forms part of CPU 62. However, there are many different ways in which memory may be coupled to the system. Memory block 61 may be used for a variety of purposes such as, for example, caching and/or storing data, programming instructions, and the like.

[0066] As used herein, the term "processor" is not limited merely to those integrated circuits referred to in the art as a processor, but broadly refers to a microcontroller,

a microcomputer, a programmable logic controller, an application-specific integrated circuit, and any other programmable circuit.

[0067] In one embodiment, interfaces 68 are provided as interface cards (sometimes referred to as "line cards"). Generally, they control the sending and receiving of data packets over a computing network and sometimes support other peripherals used with computing device 60. Among the interfaces that may be provided are Ethernet interfaces, frame relay interfaces, cable interfaces, DSL interfaces, token ring interfaces, and the like. In addition, various types of interfaces may be provided such as, for example, universal serial bus (USB), Serial, Ethernet, Firewire, PCI, parallel, radio frequency (RF), Bluetooth™, near-field communications (e.g., using near-field magnetics), 802.11 (WiFi), frame relay, TCP/IP, ISDN, fast Ethernet interfaces, Gigabit Ethernet interfaces, asynchronous transfer mode (ATM) interfaces, high-speed serial interface (HSSI) interfaces, Point of Sale (POS) interfaces, fiber data distributed interfaces (FDDIs), and the like. Generally, such interfaces 68 may include ports appropriate for communication with the appropriate media. In some cases, they may also include an independent processor and, in some instances, volatile and/or non-volatile memory (e.g., RAM).

[0068] Although the system shown in Fig. 28 illustrates one specific architecture for a computing device 60 for implementing the techniques of the invention described herein, it is by no means the only device architecture on which at least a portion of the features and techniques described herein may be implemented. For example, architectures having one or any number of processors 63 can be used, and such processors 63 can be present in a single device or distributed among any number of devices. In one embodiment, a single processor 63 handles communications as well as routing computations. In various embodiments, different types of virtual assistant features and/or functionalities may be implemented in a virtual assistant system which includes a client device (such as a personal digital assistant or smartphone running client software) and server system(s) (such as a server system described in more detail below).

[0069] Regardless of network device configuration, the system of the present invention may employ one or more memories or memory modules (such as, for example, memory block 65) configured to store data, program instructions for the general-purpose network operations and/or other information relating to the functionality of the virtual assistant techniques described herein. The program instructions may control the operation of an operating system and/or one or more applications, for example. The memory or memories may also be configured to store data structures, keyword taxonomy information, advertisement information, user click and impression information, and/or other specific non-program information described herein.

[0070] Because such information and program instructions may be employed to implement the systems/methods

ods described herein, at least some network device embodiments may include nontransitory machine-readable storage media, which, for example, may be configured or designed to store program instructions, state information, and the like for performing various operations described herein. Examples of such nontransitory machine-readable storage media include, but are not limited to, magnetic media such as hard disks, floppy disks, and magnetic tape; optical media such as CD-ROM disks; magneto-optical media such as floptical disks, and hardware devices that are specially configured to store and perform program instructions, such as read-only memory devices (ROM), flash memory, memristor memory, random access memory (RAM), and the like. Examples of program instructions include both machine code, such as produced by a compiler, and files containing higher level code that may be executed by the computer using an interpreter.

[0071] In one embodiment, the system of the present invention is implemented on a standalone computing system. Referring now to Fig. 29, there is shown a block diagram depicting an architecture for implementing at least a portion of a virtual assistant on a standalone computing system, according to at least one embodiment. Computing device 60 includes processor(s) 63 which run software for implementing virtual assistant 1002. Input device 1206 can be of any type suitable for receiving user input, including for example a keyboard, touchscreen, microphone (for example, for voice input), mouse, touchpad, trackball, five-way switch, joystick, and/or any combination thereof. Output device 1207 can be a screen, speaker, printer, and/or any combination thereof. Memory 1210 can be random-access memory having a structure and architecture as are known in the art, for use by processor(s) 63 in the course of running software. Storage device 1208 can be any magnetic, optical, and/or electrical storage device for storage of data in digital form; examples include flash memory, magnetic hard drive, CD-ROM, and/or the like.

[0072] In another embodiment, the system of the present invention is implemented on a distributed computing network, such as one having any number of clients and/or servers. Referring now to Fig. 30, there is shown a block diagram depicting an architecture for implementing at least a portion of a virtual assistant on a distributed computing network, according to at least one embodiment.

[0073] In the arrangement shown in Fig. 30, any number of clients 1304 are provided; each client 1304 may run software for implementing client-side portions of the present invention. In addition, any number of servers 1340 can be provided for handling requests received from clients 1304. Clients 1304 and servers 1340 can communicate with one another via electronic network 1361, such as the Internet. Network 1361 may be implemented using any known network protocols, including for example wired and/or wireless protocols.

[0074] In addition, in one embodiment, servers 1340

can call external services 1360 when needed to obtain additional information or refer to store data concerning previous interactions with particular users. Communications with external services 1360 can take place, for example, via network 1361. In various embodiments, external services 1360 include web-enabled services and/or functionality related to or installed on the hardware device itself. For example, in an embodiment where assistant 1002 is implemented on a smartphone or other electronic device, assistant 1002 can obtain information stored in a calendar application ("app"), contacts, and/or other sources.

[0075] In various embodiments, assistant 1002 can control many features and operations of an electronic device on which it is installed. For example, assistant 1002 can call external services 1360 that interface with functionality and applications on a device via APIs or by other means, to perform functions and operations that might otherwise be initiated using a conventional user interface on the device. Such functions and operations may include, for example, setting an alarm, making a telephone call, sending a text message or email message, adding a calendar event, and the like. Such functions and operations may be performed as add-on functions in the context of a conversational dialog between a user and assistant 1002. Such functions and operations can be specified by the user in the context of such a dialog, or they may be automatically performed based on the context of the dialog. One skilled in the art will recognize that assistant 1002 can thereby be used as a control mechanism for initiating and controlling various operations on the electronic device, which may be used as an alternative to conventional mechanisms such as buttons or graphical user interfaces.

[0076] For example, the user may provide input to assistant 1002 such as "I need to wake tomorrow at 8am". Once assistant 1002 has determined the user's intent, using the techniques described herein, assistant 1002 can call external services 1340 to interface with an alarm clock function or application on the device. Assistant 1002 sets the alarm on behalf of the user. In this manner, the user can use assistant 1002 as a replacement for conventional mechanisms for setting the alarm or performing other functions on the device. If the user's requests are ambiguous or need further clarification, assistant 1002 can use the various techniques described herein, including active elicitation, paraphrasing, suggestions, and the like, and including obtaining context information, so that the correct services 1340 are called and the intended action taken. In one embodiment, assistant 1002 may prompt the user for confirmation and/or request additional context information from any suitable source before calling a service 1340 to perform a function. In one embodiment, a user can selectively disable assistant's 1002 ability to call particular services 1340, or can disable all such service-calling if desired.

[0077] The system of the present invention can be implemented with any of a number of different types of cli-

ents 1304 and modes of operation. Referring now to Fig. 31, there is shown a block diagram depicting a system architecture illustrating several different types of clients 1304 and modes of operation. One skilled in the art will recognize that the various types of clients 1304 and modes of operation shown in Fig. 31 are merely exemplary, and that the system of the present invention can be implemented using clients 1304 and/or modes of operation other than those depicted. Additionally, the system can include any or all of such clients 1304 and/or modes of operation, alone or in any combination. Depicted examples include:

- Computer devices with input/output devices and/or sensors 1402. A client component may be deployed on any such computer device 1402. At least one embodiment may be implemented using a web browser 1304A or other software application for enabling communication with servers 1340 via network 1361. Input and output channels may of any type, including for example visual and/or auditory channels. For example, in one embodiment, the system of the invention can be implemented using voice-based communication methods, allowing for an embodiment of the assistant for the blind whose equivalent of a web browser is driven by speech and uses speech for output.
- Mobile Devices with I/O and sensors 1406, for which the client may be implemented as an application on the mobile device 1304B. This includes, but is not limited to, mobile phones, smartphones, personal digital assistants, tablet devices, networked game consoles, and the like.
- Consumer Appliances with I/O and sensors 1410, for which the client may be implemented as an embedded application on the appliance 1304C.
- Automobiles and other vehicles with dashboard interfaces and sensors 1414, for which the client may be implemented as an embedded system application 1304D. This includes, but is not limited to, car navigation systems, voice control systems, in-car entertainment systems, and the like.
- Networked computing devices such as routers 1418 or any other device that resides on or interfaces with a network, for which the client may be implemented as a device-resident application 1304E.
- Email clients 1424, for which an embodiment of the assistant is connected via an Email Modality Server 1426. Email Modality server 1426 acts as a communication bridge, for example taking input from the user as email messages sent to the assistant and sending output from the assistant to the user as replies.
- Instant messaging clients 1428, for which an embodiment of the assistant is connected via a Messaging Modality Server 1430. Messaging Modality server 1430 acts as a communication bridge, taking input from the user as messages sent to the assistant and

sending output from the assistant to the user as messages in reply.

- Voice telephones 1432, for which an embodiment of the assistant is connected via a Voice over Internet Protocol (VoIP) Modality Server 1430. VoIP Modality server 1430 acts as a communication bridge, taking input from the user as voice spoken to the assistant and sending output from the assistant to the user, for example as synthesized speech, in reply.

[0078] For messaging platforms including but not limited to email, instant messaging, discussion forums, group chat sessions, live help or customer support sessions and the like, assistant 1002 may act as a participant in the conversations. Assistant 1002 may monitor the conversation and reply to individuals or the group using one or more the techniques and methods described herein for one-to-one interactions.

[0079] In various embodiments, functionality for implementing the techniques of the present invention can be distributed among any number of client and/or server components. For example, various software modules can be implemented for performing various functions in connection with the present invention, and such modules can be variously implemented to run on server and/or client components. Further details for such an arrangement are provided in related U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference.

[0080] In the example of Fig. 32, input elicitation functionality and output processing functionality are distributed among client 1304 and server 1340, with client part of input elicitation 2794a and client part of output processing 2792a located at client 1304, and server part of input elicitation 2794b and server part of output processing 2792b located at server 1340. The following components are located at server 1340:

- complete vocabulary 2758b;
- complete library of language pattern recognizers 2760b;
- master version of short term personal memory 2752b;
- master version of long term personal memory 2754b.

[0081] In one embodiment, client 1304 maintains subsets and/or portions of these components locally, to improve responsiveness and reduce dependence on network communications. Such subsets and/or portions can be maintained and updated according to well known cache management techniques. Such subsets and/or portions include, for example:

- subset of vocabulary 2758a;
- subset of library of language pattern recognizers 2760a;

- cache of short term personal memory 2752a;
- cache of long term personal memory 2754a.

[0082] Additional components may be implemented as part of server 1340, including for example:

- language interpreter 2770;
- dialog flow processor 2780;
- output processor 2790;
- domain entity databases 2772;
- task flow models 2786;
- services orchestration 2782;
- service capability models 2788.

[0083] Each of these components will be described in more detail below. Server 1340 obtains additional information by interfacing with external services 1360 when needed.

Conceptual Architecture

[0084] Referring now to Fig. 27, there is shown a simplified block diagram of a specific example embodiment of a virtual assistant 1002. As described in greater detail in related U.S. utility applications referenced above, different embodiments of virtual assistant 1002 may be configured, designed, and/or operable to provide various different types of operations, functionalities, and/or features generally relating to virtual assistant technology. Further, as described in greater detail herein, many of the various operations, functionalities, and/or features of virtual assistant 1002 disclosed herein may enable or provide different types of advantages and/or benefits to different entities interacting with virtual assistant 1002. The embodiment shown in Fig. 27 may be implemented using any of the hardware architectures described above, or using a different type of hardware architecture.

[0085] For example, according to different embodiments, virtual assistant 1002 may be configured, designed, and/or operable to provide various different types of operations, functionalities, and/or features, such as, for example, one or more of the following (or combinations thereof):

- automate the application of data and services available over the Internet to discover, find, choose among, purchase, reserve, or order products and services. In addition to automating the process of using these data and services, virtual assistant 1002 may also enable the combined use of several sources of data and services at once. For example, it may combine information about products from several review sites, check prices and availability from multiple distributors, and check their locations and time constraints, and help a user find a personalized solution to their problem.
- automate the use of data and services available over

the Internet to discover, investigate, select among, reserve, and otherwise learn about things to do (including but not limited to movies, events, performances, exhibits, shows and attractions); places to go (including but not limited to travel destinations, hotels and other places to stay, landmarks and other sites of interest, and the like); places to eat or drink (such as restaurants and bars), times and places to meet others, and any other source of entertainment or social interaction that may be found on the Internet.

- enable the operation of applications and services via natural language dialog that are otherwise provided by dedicated applications with graphical user interfaces including search (including location-based search); navigation (maps and directions); database lookup (such as finding businesses or people by name or other properties); getting weather conditions and forecasts, checking the price of market items or status of financial transactions; monitoring traffic or the status of flights; accessing and updating calendars and schedules; managing reminders, alerts, tasks and projects; communicating over email or other messaging platforms; and operating devices locally or remotely (e.g., dialing telephones, controlling light and temperature, controlling home security devices, playing music or video, and the like). In one embodiment, virtual assistant 1002 can be used to initiate, operate, and control many functions and apps available on the device.
- offer personal recommendations for activities, products, services, source of entertainment, time management, or any other kind of recommendation service that benefits from an interactive dialog in natural language and automated access to data and services.

[0086] According to different embodiments, at least a portion of the various types of functions, operations, actions, and/or other features provided by virtual assistant 1002 may be implemented at one or more client systems (s), at one or more server system(s), and/or combinations thereof.

[0087] According to different embodiments, at least a portion of the various types of functions, operations, actions, and/or other features provided by virtual assistant 1002 may use contextual information in interpreting and operationalizing user input, as described in more detail herein.

[0088] For example, in at least one embodiment, virtual assistant 1002 may be operable to utilize and/or generate various different types of data and/or other types of information when performing specific tasks and/or operations. This may include, for example, input data/information and/or output data/information. For example, in at least one embodiment, virtual assistant 1002 may be operable to access, process, and/or otherwise utilize information from one or more different types of sources, such as, for example, one or more local and/or remote mem-

ories, devices and/or systems. Additionally, in at least one embodiment, virtual assistant 1002 may be operable to generate one or more different types of output data/information, which, for example, may be stored in memory of one or more local and/or remote devices and/or systems.

[0089] Examples of different types of input data/information which may be accessed and/or utilized by virtual assistant 1002 may include, but are not limited to, one or more of the following (or combinations thereof):

- Voice input: from mobile devices such as mobile telephones and tablets, computers with microphones, Bluetooth headsets, automobile voice control systems, over the telephone system, recordings on answering services, audio voicemail on integrated messaging services, consumer applications with voice input such as clock radios, telephone station, home entertainment control systems, and game consoles.
- Text input from keyboards on computers or mobile devices, keypads on remote controls or other consumer electronics devices, email messages sent to the assistant, instant messages or similar short messages sent to the assistant, text received from players in multiuser game environments, and text streamed in message feeds.
- Location information coming from sensors or location-based systems. Examples include Global Positioning System (GPS) and Assisted GPS (A-GPS) on mobile phones. In one embodiment, location information is combined with explicit user input. In one embodiment, the system of the present invention is able to detect when a user is at home, based on known address information and current location determination. In this manner, certain inferences may be made about the type of information the user might be interested in when at home as opposed to outside the home, as well as the type of services and actions that should be invoked on behalf of the user depending on whether or not he or she is at home.
- Time information from clocks on client devices. This may include, for example, time from telephones or other client devices indicating the local time and time zone. In addition, time may be used in the context of user requests, such as for instance, to interpret phrases such as "in an hour" and "tonight".
- Compass, accelerometer, gyroscope, and/or travel velocity data, as well as other sensor data from mobile or handheld devices or embedded systems such as automobile control systems. This may also include device positioning data from remote controls to appliances and game consoles.
- Clicking and menu selection and other events from a graphical user interface (GUI) on any device having a GUI. Further examples include touches to a touch screen.

- Events from sensors and other data-driven triggers, such as alarm clocks, calendar alerts, price change triggers, location triggers, push notification onto a device from servers, and the like.

[0090] The input to the embodiments described herein also includes the context of the user interaction history, including dialog and request history.

[0091] As described in the related U.S. Utility Applications cross-referenced above, many different types of output data/information may be generated by virtual assistant 1002. These may include, but are not limited to, one or more of the following (or combinations thereof):

- Text output sent directly to an output device and/or to the user interface of a device;
- Text and graphics sent to a user over email;
- Text and graphics sent to a user over a messaging service;
- Speech output, which may include one or more of the following (or combinations thereof):
 - Synthesized speech;
 - Sampled speech;
 - Recorded messages;
- Graphical layout of information with photos, rich text, videos, sounds, and hyperlinks (for instance, the content rendered in a web browser);
- Actuator output to control physical actions on a device, such as causing it to turn on or off, make a sound, change color, vibrate, control a light, or the like;
- Invoking other applications on a device, such as calling a mapping application, voice dialing a telephone, sending an email or instant message, playing media, making entries in calendars, task managers, and note applications, and other applications;
- Actuator output to control physical actions to devices attached or controlled by a device, such as operating a remote camera, controlling a wheelchair, playing music on remote speakers, playing videos on remote displays, and the like.

[0092] It may be appreciated that the virtual assistant 1002 of Fig. 27 is but one example from a wide range of virtual assistant system embodiments which may be implemented. Other embodiments of the virtual assistant system (not shown) may include additional, fewer and/or different components/features than those illustrated, for example, in the example virtual assistant system embodiment of Fig. 27.

[0093] Virtual assistant 1002 may include a plurality of different types of components, devices, modules, processes, systems, and the like, which, for example, may be implemented and/or instantiated via the use of hardware and/or combinations of hardware and software. For example, as illustrated in the example embodiment of

Fig. 27, assistant 1002 may include one or more of the following types of systems, components, devices, processes, and the like (or combinations thereof):

- One or more active ontologies 1050;
- Active input elicitation component(s) 2794 (may include client part 2794a and server part 2794b);
- Short term personal memory component(s) 2752 (may include master version 2752b and cache 2752a);
- Long-term personal memory component(s) 2754 (may include master version 2754b and cache 2754a; may include, for example, personal databases 1058, application preferences and usage history 1072, and the like);
- Domain models component(s) 2756;
- Vocabulary component(s) 2758 (may include complete vocabulary 2758b and subset 2758a);
- Language pattern recognizer(s) component(s) 2760 (may include full library 2760b and subset 2760a);
- Language interpreter component(s) 2770;
- Domain entity database(s) 2772;
- Dialog flow processor component(s) 2780;
- Services orchestration component(s) 2782;
- Services component(s) 2784;
- Task flow models component(s) 2786;
- Dialog flow models component(s) 2787;
- Service models component(s) 2788;
- Output processor component(s) 2790.

[0094] In certain client/server-based embodiments, some or all of these components may be distributed between client 1304 and server 1340.

[0095] In one embodiment, virtual assistant 1002 receives user input 2704 via any suitable input modality, including for example touchscreen input, keyboard input, spoken input, and/or any combination thereof. In one embodiment, assistant 1002 also receives context information 1000, which may include event context 2706 and/or any of several other types of context as described in more detail herein.

[0096] Upon processing user input 2704 and context information 1000 according to the techniques described herein, virtual assistant 1002 generates output 2708 for presentation to the user. Output 2708 can be generated according to any suitable output modality, which may be informed by context 1000 as well as other factors, if appropriate. Examples of output modalities include visual output as presented on a screen, auditory output (which may include spoken output and/or beeps and other sounds), haptic output (such as vibration), and/or any combination thereof.

[0097] Additional details concerning the operation of the various components depicted in Fig. 27 are provided in related U.S. Utility Application Serial No. 12/987,982 for "Intelligent Automated Assistant", attorney docket number P10575US1, filed January 10, 2011, the entire disclosure of which is incorporated herein by reference.

Context

[0098] As described above, in one embodiment virtual assistant 1002 acquires and applies a variety of contextual information to perform information processing functions. The following description sets forth:

- A range of sources of context information for use by virtual assistant 1002;
- Techniques for representing, organizing, and searching context information;
- Methods by which context information can support the operation of several functions of virtual assistants; and
- Methods for efficiently acquiring, accessing, and applying context information in a distributed system.

[0099] One skilled in the art will recognize that the following description of sources, techniques, and methods for using context information is merely exemplary, and that other sources, techniques, and methods can be used without departing from the essential characteristics of the present invention.

Sources of Context

[0100] Throughout phases of information processing performed by virtual assistant 1002, several different kinds of context can be used to reduce possible interpretations of user input. Examples include application context, personal data context, and previous dialog history. One skilled in the art will recognize that other sources of context may also be available.

[0101] Referring now to Fig. 1, there is shown a block diagram depicting virtual assistant 1002 and some examples of sources of context that can influence its operation according to one embodiment. Virtual assistant 1002 takes user input 2704, such as spoken or typed language, processes the input, and generates output 2708 to the user and/or performs 2710 actions on behalf of the user. It may be appreciated that virtual assistant 1002 as depicted in Fig. 1 is merely one example from a wide range of virtual assistant system embodiments which may be implemented. Other embodiments of virtual assistant systems (not shown) may include additional, fewer and/or different components/features than those illustrated, for example, in the example virtual assistant 1002 depicted in Fig. 1.

[0102] As described in more detail herein, virtual assistant 1002 can draw on any of a number of different sources of knowledge and data, such as dictionaries, domain models, and/or task models. From the perspective of the present invention, such sources, referred to as background sources, are internal to assistant 1002. In addition to user input 2704 and background sources, virtual assistant 1002 can also draw on information from several sources of context, including for example device sensor data 1056, application preferences and usage

history 1072, dialog history and assistant memory 1052, personal databases 1058, personal acoustic context data 1080, current application context 1060, and event context 2706. These will be described in detail herein.

Application Context 1060

[0103] Application context 1060 refers to the application or similar software state in which the user is doing something. For example, the user could be using a text messaging application to chat with a particular person. Virtual assistant 1002 need not be specific to or part of the user interface of the text messaging application. Rather, virtual assistant 1002 can receive context from any number of applications, with each application contributing its context to inform virtual assistant 1002.

[0104] If the user is currently using an application when virtual assistant 1002 is invoked, the state of that application can provide useful context information. For example, if virtual assistant 1002 is invoked from within an email application, context information may include sender information, recipient information, date and/or time sent, subject, data extracted from email content, mailbox or folder name, and the like.

[0105] Referring now to Figs. 11 through 13, there is shown a set of screen shots depicting examples of the use of application context in a text messaging domain to derive a referent for a pronoun, according to one embodiment. Fig. 11 depicts screen 1150 that may be displayed while the user is in a text messaging application. Fig. 12 depicts screen 1250 after virtual assistant 1002 has been activated in the context of the text messaging application. In this example, virtual assistant 1002 presents prompt 1251 to the user. In one embodiment, the user can provide spoken input by tapping on microphone icon 1252. In another embodiment, assistant 1002 is able to accept spoken input at any time, and does not require the user to tap on microphone icon 1252 before providing input; thus, icon 1252 can be a reminder that assistant 1002 is waiting for spoken input.

[0106] In Fig. 13, the user has engaged in a dialog with virtual assistant 1002, as shown on screen 1253. The user's speech input "call him" has been echoed back, and virtual assistant 1002 is responding that it will call a particular person at a particular phone number. To interpret the user's ambiguous input is, virtual assistant 1002 uses a combination of multiple sources of context to derive a referent for a pronoun, as described in more detail herein.

[0107] Referring now to Figs. 17 to 20, there is shown another example of the use of current application context to interpret and operationalize a command, according to one embodiment.

[0108] In Fig. 17, the user is presented with his or her email inbox 1750, and selects a particular email message 1751 to view. Fig. 18 depicts email message 1751 after it has been selected for viewing; in this example, email message 1751 includes an image.

[0109] In Fig. 19, the user has activated virtual assistant 1002 while viewing email message 1751 from within the email application. In one embodiment, the display of email message 1751 moves upward on the screen to make room for prompt 150 from virtual assistant 1002. This display reinforces the notion that virtual assistant 1002 is offering assistance in the context of the currently viewed email message 1751. Accordingly, the user's input to virtual assistant 1002 will be interpreted in the current context wherein email message 1751 is being viewed.

[0110] In Fig. 20, the user has provided a command 2050: "Reply let's get this to marketing right away". Context information, including information about email message 1751 and the email application in which it displayed, is used to interpret command 2050. This context can be used to determine the meaning of the words "reply" and "this" in command 2050, and to resolve how to set up an email composition transaction to a particular recipient on a particular message thread. In this case, virtual assistant 1002 is able to access context information to determine that "marketing" refers to a recipient named John Applecore and is able to determine an email address to use for the recipient. Accordingly, virtual assistant 1002 composes email 2052 for the user to approve and send. In this manner, virtual assistant 1002 is able to operationalize a task (composing an email message) based on user input together with context information describing the state of the current application.

[0111] Application context can also help identify the meaning of the user's intent across applications. Referring now to Fig. 21, there is shown an example in which the user has invoked virtual assistant 1002 in the context of viewing an email message (such as email message 1751), but the user's command 2150 says "Send him a text...". Command 2150 is interpreted by virtual assistant 1002 as indicating that a text message, rather than an email, should be sent. However, the use of the word "him" indicates that the same recipient (John Appleseed) is intended. Virtual assistant 1002 thus recognizes that the communication should go to this recipient but on a different channel (a text message to the person's phone number, obtained from contact information stored on the device). Accordingly, virtual assistant 1002 composes text message 2152 for the user to approve and send.

[0112] Examples of context information that can be obtained from application(s) include, without limitation:

- identity of the application;
- current object or objects being operated on in the application, such as current email message, current song or playlist or channel being played, current book or movie or photo, current calendar day/week/month, current reminder list, current phone call, current text messaging conversation, current map location, current web page or search query, current city or other location for location-sensitive applications, current social network profile, or any other applica-

tion-specific notion of current objects;

- names, places, dates, and other identifiable entities or values that can be extracted from the current objects.

Personal Databases 1058

[0113] Another source of context data is the user's personal database(s) 1058 on a device such as a phone, such as for example an address book containing names and phone numbers. Referring now to Fig. 14, there is shown an example of a screen shot 1451 wherein virtual assistant 1002 is prompting for name disambiguation, according to one embodiment. Here, the user has said "Call Herb"; virtual assistant 1002 prompts for the user to choose among the matching contacts in the user's address book. Thus, the address book is used as a source of personal data context.

[0114] In one embodiment, personal information of the user is obtained from personal databases 1058 for use as context for interpreting and/or operationalizing the user's intent or other functions of virtual assistant 1002. For example, data in a user's contact database can be used to reduce ambiguity in interpreting a user's command when the user referred to someone by first name only. Examples of context information that can be obtained from personal databases 1058 include, without limitation:

- the user's contact database (address book) --- including information about names, phone numbers, physical addresses, network addresses, account identifiers, important dates --- about people, companies, organizations, places, web sites, and other entities that the user might refer to;
- the user's own names, preferred pronunciations, addresses, phone numbers, and the like;
- the user's named relationships, such as mother, father, sister, boss, and the like.
- the user's calendar data, including calendar events, names of special days, or any other named entries that the user might refer to;
- the user's reminders or task list, including lists of things to do, remember, or get that the user might refer to;
- names of songs, genres, playlists, and other data associated with the user's music library that the user might refer to;
- people, places, categories, tags, labels, or other symbolic names on photos or videos or other media in the user's media library;
- titles, authors, genres, or other symbolic names in books or other literature in the user's personal library.

Dialog History 1052

[0115] Another source of context data is the user's dialog history 1052 with virtual assistant 1002. Such history may include, for example, references to domains, people,

places, and so forth. Referring now to Fig. 15, there is shown an example in which virtual assistant 1002 uses dialog context to infer the location for a command, according to one embodiment. In screen 1551, the user first asks "What's the time in New York"; virtual assistant 1002 responds 1552 by providing the current time in New York City. The user then asks "What's the weather". Virtual assistant 1002 uses the previous dialog history to infer that the location intended for the weather query is the last location mentioned in the dialog history. Therefore its response 1553 provides weather information for New York City.

[0116] As another example, if the user says "find camera shops near here" and then, after examining the results, says "how about in San Francisco?", an assistant can use the dialog context to determine that "how about" means "do the same task (find camera stores)" and "in San Francisco" means "changing the locus of the search from here to San Francisco." Virtual assistant 1002 can also use, as context, previous details of a dialog, such as previous output provided to the user. For example, if virtual assistant 1002 used a clever response intended as humor, such as "Sure thing, you're the boss", it can remember that it has already said this and can avoid repeating the phrase within a dialog session.

[0117] Examples of context information from dialog history and virtual assistant memory include, without limitation:

- people mentioned in a dialog;
- places and locations mentioned in a dialog;
- current time frame in focus;
- current application domain in focus, such as email or calendar;
- current task in focus, such as reading an email or creating a calendar entry;
- current domain objects in focus, such as an email message that was just read or calendar entry that was just created;
- current state of a dialog or transactional flow, such as whether a question is being asked and what possible answers are expected;
- history of user requests, such as "good Italian restaurants";
- history of results of user requests, such as sets of restaurants returned;
- history of phrases used by the assistant in dialog;
- facts that were told to the assistant by the user, such as "my mother is Rebecca Richards" and "I liked that restaurant".

[0118] Referring now to Figs. 25A and 25B, there is shown a series of screen shots depicting an example of the use of prior dialog context, according to one embodiment. In Fig. 25A, the user has entered a request 2550 for any new e-mail from John. Virtual assistant 1002 responds by displaying an email message 2551 from John. In Fig. 25B, the user enters the command 2552 "Reply

let's get this to marketing right away". Virtual assistant 1002 interprets command 2552 using prior dialog context; specifically, the command is interpreted to refer to the email message 2551 displayed in Fig. 25.

Device Sensor Data 1056

[0119] In one embodiment, a physical device running virtual assistant 1002 may have one or more sensors. Such sensors can provide sources of contextual information. Example of such information include, without limitation:

- the user's current location;
- the local time at the user's current location;
- the position, orientation, and motion of the device;
- the current light level, temperature and other environmental measures;
- the properties of the microphones and cameras in use;
- the current networks being used, and signatures of connected networks, including Ethernet, Wi-Fi and Bluetooth. Signatures include MAC addresses of network access points, IP addresses assigned, device identifiers such as Bluetooth names, frequency channels and other properties of wireless networks.

[0120] Sensors can be of any type including for example: an accelerometer, compass, GPS unit, altitude detector, light sensor, thermometer, barometer, clock, network interface, battery test circuitry, and the like.

Application Preferences and Usage History 1072

[0121] In one embodiment, information describing the user's preferences and settings for various applications, as well as his or her usage history 1072, are used as context for interpreting and/or operationalizing the user's intent or other functions of virtual assistant 1002. Examples of such preferences and history 1072 include, without limitation:

- shortcuts, favorites, bookmarks, friends lists, or any other collections of user data about people, companies, addresses, phone numbers, places, web sites, email messages, or any other references;
- recent calls made on the device;
- recent text message conversations, including the parties to the conversations;
- recent requests for maps or directions;
- recent web searches and URLs;
- stocks listed in a stock application;
- recent songs or video or other media played ;
- the names of alarms set on alerting applications;
- the names of applications or other digital objects on the device;
- the user's preferred language or the language in use at the user's location.

[0122] Referring now to Fig. 16, there is shown an example of the use of a telephone favorites list as a source of context, according to one embodiment. In screen 1650, a list of favorite contacts 1651 is shown. If the user provides input to "call John", this list of favorite contacts 1651 can be used to determine that "John" refers to John Appleseed's mobile number, since that number appears in the list.

Event Context 2706

[0123] In one embodiment, virtual assistant 1002 is able to use context associated with asynchronous events that happen independently of the user's interaction with virtual assistant 1002. Referring now to Figs. 22 to 24, there is shown an example illustrating activation of virtual assistant 1002 after an event occurs that can provide event context, or alert context, according to one embodiment. In this case, the event is an incoming text message 2250, as shown in Fig. 22. In Fig. 23, virtual assistant 1002 has been invoked, and text message 2250 is shown along with prompt 1251. In Fig. 24, the user has input the command "call him" 2450. Virtual assistant 1002 uses the event context to disambiguate the command by interpreting "him" to mean the person who sent the incoming text message 2250. Virtual assistant 1002 further uses the event context to determine which telephone number to use for the outbound call. Confirmation message 2451 is displayed to indicate that the call is being placed.

[0124] Examples of alert context information include, without limitation:

- incoming text messages or pages;
- incoming email messages;
- incoming phone calls;
- reminder notifications or task alerts;
- calendar alerts;
- alarm clock, timers, or other time-based alerts;
- notifications of scores or other events from games;
- notifications of financial events such as stock price alerts;
- news flashes or other broadcast notifications;
- push notifications from any application.

Personal Acoustic Context Data 1080

[0125] When interpreting speech input, virtual assistant 1002 can also take into account the acoustic environments in which the speech is entered. For example, the noise profiles of a quiet office are different from those of automobiles or public places. If a speech recognition system can identify and store acoustic profile data, these data can also be provided as contextual information. When combined with other contextual information such as the properties of the microphones in use, the current location, and the current dialog state, acoustic context can aid in recognition and interpretation of input.

Representing and Accessing Context

[0126] As described above, virtual assistant 1002 can use context information from any of a number of different sources. Any of a number of different mechanisms can be used for representing context so that it can be made available to virtual assistant 1002. Referring now to Figs. 8a through 8d, there are shown several examples of representations of context information as can be used in connection with various embodiments of the present invention.

Representing People, Places, Times, Domains, Tasks, and Objects

[0127] Fig. 8a depicts examples 801-809 of context variables that represent simple properties such as geo-coordinates of the user's current location. In one embodiment, current values can be maintained for a core set of context variables. For example, there can be a current user, a current location in focus, a current time frame in focus, a current application domain in focus, a current task in focus, and a current domain object in focus. A data structure such as shown in Fig. 8a can be used for such a representation.

[0128] Fig. 8b depicts example 850 of a more complex representation that may be used for storing context information for a contact. Also shown is an example 851 of a representation including data for a contact. In one embodiment, a contact (or person) can be represented as an object with properties for name, gender, address, phone number, and other properties that might be kept in a contacts database. Similar representations can be used for places, times, application domains, tasks, domain objects, and the like.

[0129] In one embodiment, sets of current values of a given type are represented. Such sets can refer to current people, current places, current times, and the like.

[0130] In one embodiment, context values are arranged in a history, so that at iteration N there is a frame of current context values, and also a frame of context values that were current at iteration N-1, going back to some limit on the length of history desired. Fig. 8c depicts an example of an array 811 including a history of context values. Specifically, each column of Fig. 8c represents a context variable, with rows corresponding to different times.

[0131] In one embodiment, sets of typed context variables are arranged in histories as shown in Fig. 8d. In the example, a set 861 of context variables referring to persons is shown, along with another set 871 of context variables referring to places. Thus, relevant context data for a particular time in history can be retrieved and applied.

[0132] One skilled in the art will recognize that the particular representations shown in Figs. 8a through 8d are merely exemplary, and that many other mechanisms and/or data formats for representing context can be used.

Examples include:

- In one embodiment, the current user of the system can be represented in some special manner, so that virtual assistant 1002 knows how to address the user and refer to the user's home, work, mobile phone, and the like.
- In one embodiment, relationships among people can be represented, allowing virtual assistant 1002 to understand references such as "my mother" or "my boss's house".
- Places can be represented as objects with properties such as names, street addresses, geo-coordinates, and the like.
- Times can be represented as objects with properties including universal time, time zone offset, resolution (such as year, month, day, hour, minute, or second). Time objects can also represent symbolic times such as "today", "this week", "this [upcoming] weekend", "next week", "Annie's birthday", and the like. Time objects can also represent durations or points of time.
- Context can also be provided in terms of an application domain representing a service or application or domain of discourse, such as email, text messaging, phone, calendar, contacts, photos, videos, maps, weather, reminders, clock, web browser, Facebook, Pandora, and so forth. The current domain indicates which of these domains is in focus.
- Context can also define one or more tasks, or operations to perform within a domain. For example, within the email domain there are tasks such as read email message, search email, compose new email, and the like.
- Domain Objects are data objects associated with the various domains. For example, the email domain operates on email messages, the calendar domain operates on calendar events, and the like.

[0133] For purposes of the description provided herein, these representations of contextual information are referred to as context variables of a given type. For example, a representation of the current user is a context variable of type Person.

Representing Context Derivation

[0134] In one embodiment, the derivation of context variables is represented explicitly, so that it can be used in information processing. The derivation of context information is a characterization of the source and/or sets of inferences made to conclude or retrieve the information. For example, a Person context value 851 as depicted in Fig. 8b might have been derived from a Text Message Domain Object, which was acquired from Event Context 2706. This source of the context value 851 can be represented.

Representing a History of User Requests and/or Intent

[0135] In one embodiment, a history of the user's requests can be stored. In one embodiment, a history of the deep structure representation of the user's intent (as derived from natural language processing) can be stored as well. This allows virtual assistant 1002 to make sense of new inputs in the context of previously interpreted input. For example, if the user asks "what is the weather in New York?", language interpreter 2770 might interpret the question as referring to the location of New York. If the user then says "what is it for this weekend?" virtual assistant 1002 can refer to this previous interpretation to determine that "what is it" should be interpreted to mean "what is the weather".

Representing a History of Results

[0136] In one embodiment, a history of the results of user's requests can be stored, in the form of domain objects. For example, the user request "find me some good Italian restaurants" might return a set of domain objects representing restaurants. If the user then enters a command such as "call Amilio's", virtual assistant 1002 can search the results for restaurants named Amilio's within the search results, which is a smaller set than all possible places that can be called.

Delayed Binding of Context Variables

[0137] In one embodiment, context variables can represent information that is retrieved or derived on demand. For example, a context variable representing the current location, when accessed, can invoke an API that retrieves current location data from a device and then does other processing to compute, for instance, a street address. The value of that context variable can be maintained for some period of time, depending on a caching policy.

Searching Context

[0138] Virtual assistant 1002 can use any of a number of different approaches to search for relevant context information to solve information-processing problems. Example of different types of searches include, without limitation:

- **Search by context variable name.** If the name of a required context variable is known, such as "current user first name", virtual assistant 1002 can search for instances of it. If a history is kept, virtual assistant 1002 can search current values first, and then consult earlier data until a match is found.
- **Search by context variable type.** If the type of a required context variable is known, such as Person,

virtual assistant 1002 can search for instances of context variables of this type. If a history is kept, virtual assistant 1002 can search current values first, and then consult earlier data until a match is found.

[0139] In one embodiment, if the current information processing problem requires a single match, the search is terminated once a match is found. If multiple matches are allowed, matching results can be retrieved in order until some limit is reached.

[0140] In one embodiment, if appropriate, virtual assistant 1002 can constrain its search to data having certain derivation. For example, if looking for People objects within a task flow for email, virtual assistant 1002 might only consider context variables whose derivation is an application associated with that domain.

[0141] In one embodiment, virtual assistant 1002 uses rules to rank matches according to heuristics, using any available properties of context variables. For example, when processing user input including a command to "tell her I'll be late", virtual assistant 1002 interprets "her" by reference to context. In doing so, virtual assistant 1002 can apply ranking to indicate a preference for People objects whose derivation is application usage histories for communication applications such as text messaging and email. As another example, when interpreting a command to "call her", virtual assistant 1002 can apply ranking to prefer People objects that have phone numbers over those whose phone numbers are not known. In one embodiment, ranking rules can be associated with domains. For example, different ranking rules can be used for ranking Person variables for Email and Phone domains. One skilled in the art will recognize that any such ranking rule(s) can be created and/or applied, depending on the particular representation and access to context information needed.

Use of Context to Improve Virtual Assistant Processing

[0142] As described above, context can be applied to a variety of computations and inferences in connection with the operation of virtual assistant 1002. Referring now to Fig. 2, there is shown a flow diagram depicting a method 10 for using context at various stages of processing in virtual assistant 1002, according to one embodiment.

[0143] Method 10 may be implemented in connection with one or more embodiments of virtual assistant 1002.

[0144] In at least one embodiment, method 10 may be operable to perform and/or implement various types of functions, operations, actions, and/or other features such as, for example, one or more of the following (or combinations thereof):

- Execute an interface control flow loop of a conversational interface between the user and virtual assistant 1002. At least one iteration of method 10 may serve as a ply in the conversation. A conversational

interface is an interface in which the user and assistant 1002 communicate by making utterances back and forth in a conversational manner.

- Provide executive control flow for virtual assistant 1002. That is, the procedure controls the gathering of input, processing of input, generation of output, and presentation of output to the user.
- Coordinate communications among components of virtual assistant 1002. That is, it may direct where the output of one component feeds into another, and where the overall input from the environment and action on the environment may occur.

[0145] In at least some embodiments, portions of method 10 may also be implemented at other devices and/or systems of a computer network.

[0146] According to specific embodiments, multiple instances or threads of method 10 may be concurrently implemented and/or initiated via the use of one or more processors 63 and/or other combinations of hardware and/or hardware and software. In at least one embodiment, one or more or selected portions of method 10 may be implemented at one or more client(s) 1304, at one or more server(s) 1340, and/or combinations thereof.

[0147] For example, in at least some embodiments, various aspects, features, and/or functionalities of method 10 may be performed, implemented and/or initiated by software components, network services, databases, and/or the like, or any combination thereof.

[0148] According to different embodiments, one or more different threads or instances of method 10 may be initiated in response to detection of one or more conditions or events satisfying one or more different types of criteria (such as, for example, minimum threshold criteria) for triggering initiation of at least one instance of method 10. Examples of various types of conditions or events which may trigger initiation and/or implementation of one or more different threads or instances of the method may include, but are not limited to, one or more of the following (or combinations thereof):

- a user session with an instance of virtual assistant 1002, such as, for example, but not limited to, one or more of:
 - a mobile device application starting up, for instance, a mobile device application that is implementing an embodiment of virtual assistant 1002;
 - a computer application starting up, for instance, an application that is implementing an embodiment of virtual assistant 1002;
 - a dedicated button on a mobile device pressed, such as a "speech input button";
 - a button on a peripheral device attached to a computer or mobile device, such as a headset, telephone handset or base station, a GPS navigation system, consumer appliance, remote

control, or any other device with a button that might be associated with invoking assistance;

- a web session started from a web browser to a website implementing virtual assistant 1002;
- an interaction started from within an existing web browser session to a website implementing virtual assistant 1002, in which, for example, virtual assistant 1002 service is requested;
- an email message sent to a modality server 1426 that is mediating communication with an embodiment of virtual assistant 1002;
- a text message is sent to a modality server 1426 that is mediating communication with an embodiment of virtual assistant 1002;
- a phone call is made to a modality server 1434 that is mediating communication with an embodiment of virtual assistant 1002;
- an event such as an alert or notification is sent to an application that is providing an embodiment of virtual assistant 1002.

- when a device that provides virtual assistant 1002 is turned on and/or started.

[0149] According to different embodiments, one or more different threads or instances of method 10 may be initiated and/or implemented manually, automatically, statically, dynamically, concurrently, and/or combinations thereof. Additionally, different instances and/or embodiments of method 10 may be initiated at one or more different time intervals (e.g., during a specific time interval, at regular periodic intervals, at irregular periodic intervals, upon demand, and the like).

[0150] In at least one embodiment, a given instance of method 10 may utilize and/or generate various different types of data and/or other types of information when performing specific tasks and/or operations, including context data as described herein. Data may also include any other type of input data/information and/or output data/information. For example, in at least one embodiment, at least one instance of method 10 may access, process, and/or otherwise utilize information from one or more different types of sources, such as, for example, one or more databases. In at least one embodiment, at least a portion of the database information may be accessed via communication with one or more local and/or remote memory devices. Additionally, at least one instance of method 10 may generate one or more different types of output data/information, which, for example, may be stored in local memory and/or remote memory devices.

[0151] In at least one embodiment, initial configuration of a given instance of method 10 may be performed using one or more different types of initialization parameters. In at least one embodiment, at least a portion of the initialization parameters may be accessed via communication with one or more local and/or remote memory devices. In at least one embodiment, at least a portion of the initialization parameters provided to an instance of meth-

od 10 may correspond to and/or may be derived from the input data/information.

[0152] In the particular example of Fig. 2, it is assumed that a single user is accessing an instance of virtual assistant 1002 over a network from a client application with speech input capabilities.

[0153] Speech input is elicited and interpreted 100. Elicitation may include presenting prompts in any suitable mode. In various embodiments, the user interface of the client offers several modes of input. These may include, for example:

- an interface for typed input, which may invoke an active typed-input elicitation procedure;
- an interface for speech input, which may invoke an active speech input elicitation procedure.
- an interface for selecting inputs from a menu, which may invoke active GUI-based input elicitation.

[0154] Techniques for performing each of these are described in the above-referenced related patent applications. One skilled in the art will recognize that other input modes may be provided. The output of step 100 is a set of candidate interpretations 190 of the input speech.

[0155] The set of candidate interpretations 190 is processed 200 by language interpreter 2770 (also referred to as a natural language processor, or NLP), which parses the text input and generates a set of possible interpretations of the user's intent 290.

[0156] In step 300, the representation(s) of the user's intent 290 is/are passed to dialog flow processor 2780, which implements an embodiment of a dialog and flow analysis procedure as described in connection with Fig. 5. Dialog flow processor 2780 determines which interpretation of intent is most likely, maps this interpretation to instances of domain models and parameters of a task model, and determines the next flow step in a task flow.

[0157] In step 400, the identified flow step is executed. In one embodiment, invocation of the flow step is performed by services orchestration component 2782 which invokes a set of services on behalf of the user's request. In one embodiment, these services contribute some data to a common result.

[0158] In step 500 a dialog response is generated. In step 700, the response is sent to the client device for output thereon. Client software on the device renders it on the screen (or other output device) of the client device.

[0159] If, after viewing the response, the user is done 790, the method ends. If the user is not done, another iteration of the loop is initiated by returning to step 100.

[0160] Context information 1000 can be used by various components of the system at various points in method 10. For example, as depicted in Fig. 2, context 1000 can be used at steps 100, 200, 300, and 500. Further description of the use of context 1000 in these steps is provided below. One skilled in the art will recognize, however, that the use of context information is not limited to these specific steps, and that the system can use context

information at other points as well, without departing from the essential characteristics of the present invention.

[0161] In addition, one skilled in the art will recognize that different embodiments of method 10 may include additional features and/or operations than those illustrated in the specific embodiment depicted in Fig. 2, and/or may omit at least a portion of the features and/or operations of method 10 as illustrated in the specific embodiment of Fig. 2.

Use of Context in Speech Elicitation and Interpretation

[0162] Referring now to Fig. 3, there is shown a flow diagram depicting a method for using context in speech elicitation and interpretation 100, so as to improve speech recognition according to one embodiment. Context 1000 can be used, for example, for disambiguation in speech recognition to guide the generation, ranking, and filtering of candidate hypotheses that match phonemes to words. Different speech recognition systems use various mixes of generation, rank, and filter, but context 1000 can apply in general to reduce the hypothesis space at any stage.

[0163] The method begins 100. Assistant 1002 receives 121 voice or speech input in the form of an auditory signal. A speech-to-text service 122 or processor generates a set of candidate text interpretations 124 of the auditory signal. In one embodiment, speech-to-text service 122 is implemented using, for example, Nuance Recognizer, available from Nuance Communications, Inc. of Burlington, Massachusetts.

[0164] In one embodiment, assistant 1002 employs statistical language models 1029 to generate candidate text interpretations 124 of speech input 121. In one embodiment context 1000 is applied to bias the generation, filtering, and/or ranking of candidate interpretations 124 generated by speech-to-text service 122. For example:

- Speech-to-text service 122 can use vocabulary from user personal database(s) 1058 to bias statistical language models 1029.
- Speech-to-text service 122 can use dialog state context to select a custom statistical language model 1029. For example, when asking a yes/no question, a statistical language model 1029 can be selected that biases toward hearing these words.
- Speech-to-text service 122 can use current application context to bias toward relevant words. For example "call her" can be preferred over "collar" in a text message application context, since such a context provides Person Objects that can be called.

[0165] For example, a given speech input might lead speech-to-text service 122 to generate interpretations "call her" and "collar". Guided by statistical language models (SLMs) 1029, speech-to-text service 122 can be tuned by grammatical constraints to hear names after it

hears "call". Speech-to-text service 122 can be also tuned based on context 1000. For example, if "Herb" is a first name in the user's address book, then this context can be used to lower the threshold for considering "Herb" as an interpretation of the second syllable. That is, the presence of names in the user's personal data context can influence the choice and tuning of the statistical language model 1029 used to generate hypotheses. The name "Herb" can be part of a general SLM 1029 or it can be added directly by context 1000. In one embodiment, it can be added as an additional SLM 1029, which is tuned based on context 1000. In one embodiment, it can be a tuning of an existing SLM 1029, which is tuned based on context 1000.

[0166] In one embodiment, statistical language models 1029 are also tuned to look for words, names, and phrases from application preferences and usage history 1072 and/or personal databases 1058, which may be stored in long-term personal memory 2754. For example, statistical language models 1029 can be given text from to-do items, list items, personal notes, calendar entries, people names in contacts/address books, email addresses, street or city names mentioned in contact/address books, and the like.

[0167] A ranking component analyzes candidate interpretations 124 and ranks 126 them according to how well they fit syntactic and/or semantic models of virtual assistant 1002. Any sources of constraints on user input may be used. For example, in one embodiment, assistant 1002 may rank the output of the speech-to-text interpreter according to how well the interpretations parse in a syntactic and/or semantic sense, a domain model, task flow model, and/or dialog model, and/or the like: it evaluates how well various combinations of words in candidate interpretations 124 would fit the concepts, relations, entities, and properties of an active ontology and its associated models, as described in above-referenced related U.S. utility applications.

[0168] Ranking 126 of candidate interpretations can also be influenced by context 1000. For example, if the user is currently carrying on a conversation in a text messaging application when virtual assistant 1002 is invoked, the phrase "call her" is more likely to be a correct interpretation than the word "collar", because there is a potential "her" to call in this context. Such bias can be achieved by tuning the ranking of hypotheses 126 to favor phrases such as "call her" or "call <contact name>" when the current application context indicates an application that can provide "callable entities".

[0169] In various embodiments, algorithms or procedures used by assistant 1002 for interpretation of text inputs, including any embodiment of the natural language processing procedure shown in Fig. 3, can be used to rank and score candidate text interpretations 124 generated by speech-to-text service 122.

[0170] Context 1000 can also be used to filter candidate interpretations 124, instead of or in addition to constraining the generation of them or influencing the ranking

of them. For example, a filtering rule could prescribe that the context of the address book entry for "Herb" sufficiently indicates that the phrase containing it should be considered a top candidate 130, even if it would otherwise be below a filtering threshold. Depending on the particular speech recognition technology being used, constraints based on contextual bias can be applied at the generation, rank, and/or filter stages.

[0171] In one embodiment, if ranking component 126 determines 128 that the highest-ranking speech interpretation from interpretations 124 ranks above a specified threshold, the highest-ranking interpretation may be automatically selected 130. If no interpretation ranks above a specified threshold, possible candidate interpretations of speech 134 are presented 132 to the user. The user can then select 136 among the displayed choices.

[0172] Referring now also to Figs. 26A and 26B, there are shown screen shots depicting an example of a user interface for selecting among candidate interpretations, according to one embodiment. Fig. 26A shows a presentation of the user's speech with dots underlying an ambiguous interpretation 2651. If the user taps on the text, it shows alternative interpretations 2652A, 2652B as depicted in Fig. 26B. In one embodiment, context 1000 can influence which of the candidate interpretations 2652A, 2652B is a preferred interpretation (which is shown as an initial default as in Fig. 26A) and also the selection of a finite set of alternatives to present as in Fig. 26B.

[0173] In various embodiments, user selection 136 among the displayed choices can be achieved by any mode of input, including for example multimodal input. Such input modes include, without limitation, actively elicited typed input, actively elicited speech input, actively presented GUI for input, and/or the like. In one embodiment, the user can select among candidate interpretations 134, for example by tapping or speaking. In the case of speaking, the possible interpretation of the new speech input is highly constrained by the small set of choices offered 134.

[0174] Whether input is automatically selected 130 or selected 136 by the user, the resulting one or more text interpretation(s) 190 is/are returned. In at least one embodiment, the returned input is annotated, so that information about which choices were made in step 136 is preserved along with the textual input. This enables, for example, the semantic concepts or entities underlying a string to be associated with the string when it is returned, which improves accuracy of subsequent language interpretation.

[0175] Any of the sources described in connection with Fig. 1 can provide context 1000 to the speech elicitation and interpretation method depicted in Fig. 3. For example:

- Personal Acoustic Context Data 1080 be used to select from possible SLMs 1029 or otherwise tune them to optimize for recognized acoustical contexts.
- Device Sensor Data 1056, describing properties of

- microphones and/or cameras in use, can be used to select from possible SLMs 1029 or otherwise tune them to optimize for recognized acoustical contexts.
- Vocabulary from personal databases 1058 and application preferences and usage history 1072 can be used as context 1000. For example, the titles of media and names of artists can be used to tune language models 1029.
- Current dialog state, part of dialog history and assistant memory 1052, can be used to bias the generate/filter/rank of candidate interpretations 124 by text-to-speech service 122. For example, one kind of dialog state is asking a yes/no question. When in such a state, procedure 100 can select an SLM 1029 that biases toward hearing these words, or it can bias the ranking and filtering of these words in a context-specific tuning at 122.

Use of Context in Natural Language Processing

[0176] Context 1000 can be used to facilitate natural language processing (NLP) - the parsing of text input into semantic structures representing the possible parses. Referring now to Fig. 4, there is shown a flow diagram depicting a method for using context in natural language processing as may be performed by language interpreter 2770, according to one embodiment.

[0177] The method begins 200. Input text 202 is received. In one embodiment, input text 202 is matched 210 against words and phrases using pattern recognizers 2760, vocabulary databases 2758, ontologies and other models 1050, so as to identify associations between user input and concepts. Step 210 yields a set of candidate syntactic parses 212, which are matched for semantic relevance 220 producing candidate semantic parses 222. Candidate parses are then processed to remove ambiguous alternatives at 230, filtered and sorted by relevance 232, and returned.

[0178] Throughout natural language processing, contextual information 1000 can be applied to reduce the hypothesis space and constrain possible parses. For example, if language interpreter 2770 receives two candidates "call her" and "call Herb" to, then language interpreter 2770 would find bindings 212 for the words "call", "her", and "Herb". Application context 1060 can be used to constrain the possible word senses for "call" to mean "phone call". Context can also be used to find the referents for "her" and "Herb". For "her", the context sources 1000 could be searched for a source of callable entities. In this example, the party to a text messaging conversation is a callable entity, and this information is part of the context coming from the text messaging application. In the case of "Herb", the user's address book is a source of disambiguating context, as are other personal data such as application preferences (such as favorite numbers from domain entity databases 2772) and application usage history (such as recent phone calls from domain entity databases 2772). In an example where the current

text messaging party is RebeccaRichards and there is a HerbGowen in the user's address book, the two parses created by language interpreter 2770 would be semantic structures representing "PhoneCall(RebeccaRichards)" and "PhoneCall (HerbGowen)".

[0179] Data from application preferences and usage history 1072, dialog history and assistant memory 1052, and/or personal databases 1058 can also be used by language interpreter 2770 in generating candidate syntactic parses 212. Such data can be obtained, for example, from short- and/or long-term memory 2752, 2754. In this manner, input that was provided previously in the same session, and/or known information about the user, can be used to improve performance, reduce ambiguity, and reinforce the conversational nature of the interaction. Data from active ontology 1050, domain models 2756, and task flow models 2786 can also be used, to implement evidential reasoning in determining valid candidate syntactic parses 212.

[0180] In semantic matching 220, language interpreter 2770 considers combinations of possible parse results according to how well they fit semantic models such as domain models and databases. Semantic matching 220 may use data from, for example, active ontology 1050, short term personal memory 2752, and long term personal memory 2754. For example, semantic matching 220 may use data from previous references to venues or local events in the dialog (from dialog history and assistant memory 1052) or personal favorite venues (from application preferences and usage history 1072). Semantic matching 220 step also uses context 1000 to interpret phrases into domain intent structures. A set of candidate, or potential, semantic parse results is generated 222.

[0181] In disambiguation step 230, language interpreter 2770 weighs the evidential strength of candidate semantic parse results 222. Disambiguation 230 involves reducing the number of candidate semantic parse 222 by eliminating unlikely or redundant alternatives. Disambiguation 230 may use data from, for example, the structure of active ontology 1050. In at least one embodiment, the connections between nodes in an active ontology provide evidential support for disambiguating among candidate semantic parse results 222. In one embodiment, context 1000 is used to assist in such disambiguation. Examples of such disambiguation include: determining one of several people having the same name; determining a referent to a command such as "reply" (email or text message); pronoun dereferencing; and the like.

[0182] For example, input such as "call Herb" potentially refers to any entity matching "Herb". There could be any number of such entities, not only in the user's address book (personal databases 1058) but also in databases of names of businesses from personal databases 1058 and/or domain entity databases 2772. Several sources of context can constrain the set of matching "Herbs", and/or rank and filter them in step 232. For example:

- Other Application Preferences and Usage history 1072, such as a Herb who is on a favorite phone numbers list, or recently called, or recently party to a text message conversation or email thread;
- Herb mentioned in personal databases 1058, such as a Herb who is named as relationship, such as father or brother, or listed participant in a recent calendar event. If the task were playing media instead of phone calling, then the names from media titles, creators, and the like would be sources of constraint;
- A recent ply of a dialog 1052, either in request or results. For example, as described above in connection with Figs. 25A to 25B, after searching for email from John, with the search result still in the dialog context, the user can compose a reply. Assistant 1002 can use the dialog context to identify the specific application domain object context.

[0183] Context 1000 can also help reduce the ambiguity in words other than proper names. For example, if the user of an email application tells assistant 1002 to "reply" (as depicted in Fig. 20), the context of the application helps determine that the word should be associated with EmailReply as opposed to TextMessagingReply.

[0184] In step 232, language interpreter 2770 filters and sorts 232 the top semantic parses as the representation of user intent 290. Context 1000 can be used to inform such filtering and sorting 232. The result is a representation of user intent 290.

Use of Context in Task Flow Processing

[0185] Referring now to Fig. 5, there is shown a flow diagram depicting a method for using context in task flow processing as may be performed by dialog flow processor 2780, according to one embodiment. In task flow processing, candidate parses generated from the method of Fig. 4 are ranked and instantiated to produce operational task descriptions that can be executed.

[0186] The method begins 300. Multiple candidate representations of user intent 290 are received. As described in connection with Fig. 4, in one embodiment, representations of user intent 290 include a set of semantic parses.

[0187] In step 312, dialog flow processor 2780 determines the preferred interpretation of the semantic parse(s) with other information to determine a task to perform and its parameters, based on a determination of the user's intent. Information may be obtained, for example, from domain models 2756, task flow models 2786, and/or dialog flow models 2787, or any combination thereof. For example, a task might be PhoneCall and a task parameter is the PhoneNumber to call.

[0188] In one embodiment, context 1000 is used in performing step 312, to guide the binding of parameters 312 by inferring default values and resolving ambiguity. For example, context 1000 can guide the instantiation of the

task descriptions and determining whether there is a best interpretation of the user's intent.

[0189] For example, assume the intent inputs 290 are PhoneCall(RebeccaRichards)" and "PhoneCall (Herb-Gowen)". The PhoneCall task requires parameter PhoneNumber. Several sources of context 1000 can be applied to determine which phone number for Rebecca and Herb would work. In this example, the address book entry for Rebecca in a contacts database has two phone numbers and the entry for Herb has no phone numbers but one email address. Using the context information 1000 from personal databases 1058 such as the contacts database allows virtual assistant 1002 to prefer Rebecca over Herb, since there is a phone number for Rebecca and none for Herb. To determine which phone number to use for Rebecca, application context 1060 can be consulted to choose the number that is being used to carry on text messaging conversation with Rebecca. Virtual assistant 1002 can thus determine that "call her" in the context of a text messaging conversation with Rebecca Richards means make a phone call to the mobile phone that Rebecca is using for text messaging. This specific information is returned in step 390.

[0190] Context 1000 can be used for more than reducing phone number ambiguity. It can be used whenever there are multiple possible values for a task parameter, as long as any source of context 1000 having values for that parameter is available. Other examples in which context 1000 can reduce the ambiguity (and avoid having to prompt the user to select among candidates) include, without limitation: email addresses; physical addresses; times and dates; places; list names; media titles; artist names; business names; or any other value space.

[0191] Other kinds of inferences required for task flow processing 300 can also benefit from context 1000. For example, default value inference can use the current location, time, and other current values. Default value inference is useful for determining the values of task parameters that are implicit in the user's request. For example, if someone says "what is the weather like?" they implicitly mean what is the current weather like around here.

[0192] In step 310, dialog flow processor 2780 determines whether this interpretation of user intent is supported strongly enough to proceed, and/or if it is better supported than alternative ambiguous parses. If there are competing ambiguities or sufficient uncertainty, then step 322 is performed, to set the dialog flow step so that the execution phase causes the dialog to output a prompt for more information from the user. An example of a screen shot for prompting the user to resolve an ambiguity is shown in Fig. 14. Context 1000 can be used in step 322 in sorting and annotating the displayed menu of candidate items for the user to choose from.

[0193] In step 320, the task flow model is consulted to determine an appropriate next step. Information may be obtained, for example, from domain models 2756, task flow models 2786, and/or dialog flow models 2787, or

any combination thereof.

[0194] The result of step 320 or step 322 is a representation of the user's request 390, which may include the task parameters sufficient for dialog flow processor 2780 and services orchestration 2782 to dispatch to the appropriate service.

Use of Context to Improve Dialog Generation

[0195] During dialog response generation 500, assistant 1002 may paraphrase back its understanding of the user's intent and how it is being operationalized in a task. An example of such output is "OK, I'll call Rebecca on her mobile..." This allows the user to authorize assistant 1002 to perform the associated task automation, such as placing a call. In dialog generation step 500, assistant 1002 determines how much detail to convey back to the user in paraphrasing its understanding of the user's intent.

[0196] In one embodiment, context 1000 can also be used to guide selection of the appropriate level of detail in the dialog, as well as to filter based on previous output (so as to avoid repeating information). For example, assistant 1002 can use the knowledge that the person and phone number were inferred from context 1000 to determine whether to mention the name and phone number and in what level of detail. Examples of rules that can be applied include, without limitation:

- When a pronoun is resolved by context, mention the person to call by name.
- When a person is inferred from a familiar context such as text messaging, use only the first name.
- When a phone number is inferred from application or personal data context, use the symbolic name of the phone number such as "mobile phone" rather than the actual number to dial.

[0197] In addition to guiding the appropriate level of detail, context 1000 can also be used in dialog generation step 500, for example, to filter previous utterances, so as to avoid repetition, and to refer to previously mentioned entities in the conversation.

[0198] One skilled in the art will recognize that context 1000 can also be used in other ways. For example, in connection with the techniques described herein, context 1000 can be used according to mechanisms described in related U.S. Utility Application Serial No. 12/479,477 for "Contextual Voice Commands", attorney docket number P7393US1, filed June 5, 2009, the entire disclosure of which is incorporated herein by reference.

Context Gathering and Communication Mechanisms

[0199] In various embodiments, different mechanisms are used for gathering and communicating context information in virtual assistant 1002. For example, in one embodiment, wherein virtual assistant 1002 is implemented

in a client/server environment so that its services are distributed between the client and the server, sources of context 1000 may also be distributed.

[0200] Referring now to Fig. 6, there is shown an example of distribution of sources of context 1000 between client 1304 and server 1340 according to one embodiment. Client device 1304, which may be a mobile computing device or other device, can be the source of contextual information 1000 such as device sensor data 1056, current application context 1060, event context 2706, and the like. Other sources of context 1000 can be distributed on client 1304 or server 1340, or some combination of both. Examples include application preferences and usage history 1072c, 1072s; dialog history and assistant memory 1052c, 1052s; personal databases 1058c, 1058s; and personal acoustic context data 1080c, 1080s. In each of these examples, sources of context 1000 may exist on server 1340, on client 1304, or on both. Furthermore, as described above, the various steps depicted in Fig. 2 can be performed by client 1304 or server 1340, or some combination of both.

[0201] In one embodiment, context 1000 can be communicated among distributed components such as client 1304 and server 1340. Such communication can be over a local API or over a distributed network, or by some other means.

[0202] Referring now to Figs. 7a through 7d, there are shown event diagrams depicting examples of mechanisms for obtaining and coordinating context information 1000 according to various embodiments. Various techniques exist for loading, or communicating, context so that it is available to virtual assistant 1002 when needed or useful. Each of these mechanisms is described in terms of four events that can place with regard to operation of virtual assistant 1002: device or application initialization 601; initial user input 602; initial input processing 603, and context-dependent processing 604.

[0203] Fig. 7a depicts an approach in which context information 1000 is loaded using a "pull" mechanism once user input has begun 602. Once user invokes virtual assistant 1002 and provides at least some input 602, virtual assistant 1002 loads 610 context 1000. Loading 610 can be performed by requesting or retrieving context information 1000 from an appropriate source. Input processing 603 starts once context 1000 has been loaded 610.

[0204] Fig. 7b depicts an approach in which some context information 1000 is loaded 620 when a device or application is initialized 601; additional context information 1000 is loaded using a pull mechanism once user input has begun 602. In one embodiment, context information 1000 that is loaded 620 upon initialization can include static context (i.e., context that does not change frequently); context information 1000 that is loaded 621 once user input starts 602 includes dynamic context (i.e., context that may have changed since static context was loaded 620). Such an approach can improve performance by removing the cost of loading static context infor-

mation 1000 from the runtime performance of the system.

[0205] Fig. 7c depicts a variation of the approach of Fig. 7b. In this example, dynamic context information 1000 is allowed to continue loading 621 after input processing begins 603. Thus, loading 621 can take place in parallel with input processing. Virtual assistant 1002 procedure is only blocked at step 604 when processing depends on received context information 1000.

[0206] Fig. 7d depicts a fully configurable version, which handles context in any of up to five different ways:

- Static contextual information 1000 is synchronized 640 in one direction, from context source to the environment or device that runs virtual assistant 1002. As data changes in the context source, the changes are pushed to virtual assistant 1002. For example, an address book might be synchronized to virtual assistant 1002 when it is initially created or enabled. Whenever the address book is modified, changes are pushed to the virtual assistant 1002, either immediately or in a batched approach. As depicted in Fig. 7d, such synchronization 640 can take place at any time, including before user input starts 602.
- In one embodiment, when user input starts 602, static context sources can be checked for synchronization status. If necessary, a process of synchronizing remaining static context information 1000 is begun 641.
- When user input starts 602, some dynamic context 1000 is loaded 642, as it was in 610 and 621 Procedures that consume context 1000 are only blocked to wait for the as-yet unloaded context information 1000 they need.
- Other context information 1000 is loaded on demand 643 by processes when they need it.
- Event context 2706 is sent 644 from source to the device running virtual assistant 1002 as events occur. Processes that consume event context 2706 only wait for the cache of events to be ready, and can proceed without blocking any time thereafter. Event context 2706 loaded in this manner may include any of the following:
 - Event context 2706 loaded before user input starts 602, for example unread message notifications. Such information can be maintained, for example, using a synchronized cache.
 - Event context 2706 loaded concurrently with or after user input has started 602. For an example, while the user is interacting with virtual assistant 1002, a text message may arrive; the event context that notifies assistant 1002 of this event can be pushed in parallel with assistant 1002 processing.

[0207] In one embodiment, flexibility in obtaining and coordinating context information 1000 is accomplished by prescribing, for each source of context information

1000, a communication policy and an access API that balances the cost of communication against the value of having the information available on every request. For example, variables that are relevant to every speech-to-text request, such as personal acoustic context data 1080 or device sensor data 1056 describing parameters of microphones, can be loaded on every request. Such communication policies can be specified, for example, in a configuration table.

[0208] Referring now to Fig. 9, there is shown an example of a configuration table 900 that can be used for specifying communication and caching policies for various sources of context information 1000, according to one embodiment. For each of a number of different context sources, including user name, address book names, address book numbers, SMS event context, and calendar database, a particular type of context loading is specified for each of the steps of Fig. 2: elicit and interpret speech input 100, interpret natural language 200, identify task 300, and generate dialog response 500. Each entry in table 900 indicates one of the following:

- Sync: context information 1000 is synchronized on the device;
- On demand: context information 1000 is provided in response to virtual assistant's 1002 request for it;
- Push: context information 1000 is pushed to the device.

[0209] The fully configurable method allows a large space of potentially relevant contextual information 1000 to be made available to streamline the natural language interaction between human and machine. Rather than loading all of this information all of the time, which could lead to inefficiencies, some information is maintained in both the context source and virtual assistant 1002, while other information is queried on demand. For example, as described above, information such as names used in real time operations such as speech recognition is maintained locally, while information that is only used by some possible requests such as a user's personal calendar is queried on demand. Data that cannot be anticipated at the time of a user's invoking the assistant such as incoming SMS events are pushed as they happen.

[0210] Referring now to Fig. 10, there is shown an event diagram 950 depicting an example of accessing the context information sources configured in Fig. 9 during the processing of an interaction sequence in which assistant 1002 is in dialog with a user, according to one embodiment.

[0211] The sequence depicted in Fig. 10 represents the following interaction sequence:

- T₁: Assistant 1002: "Hello Steve, what I can I do for you?"
- T₂: User: "When is my next meeting?"
- T₃: Assistant 1002: "Your next meeting is at 1:00pm in the boardroom."

- T₄: [Sound of incoming SMS message]
- T₅: User: "Read me that message."
- T₆: Assistant 1002: "Your message from Johnny says 'How about lunch'"
- T₇: User: "Tell Johnny I can't make it today."
- T₈: Assistant 1002: "OK, I'll tell him."

[0212] At time T₀, before the interaction begins, user name is synched 770 and address book names are synched 771. These are examples of static context loaded at initialization time, as shown in element 640 of Fig. 7d. This allows assistant 1002 to refer to the user by his first name ("Steve").

[0213] At time T₁, synching steps 770 and 771 are complete. At time T₂, the user speaks a request, which is processed according to steps 100, 200, and 300 of Fig. 2. In task identification step 300, virtual assistant 1002 queries 774 user's personal database 1058 as a source of context 1000: specifically, virtual assistant 1002 requests information from the user's calendar database, which is configured for on demand access according to table 900. At time T₃, step 500 is performed and a dialog response is generated.

[0214] At time T₄, an SMS message is received; this is an example of event context 2706. Notification of the event is pushed 773 to virtual assistant 1002, based on the configuration in table 900.

[0215] At time T₅, the user asks virtual assistant 1002 to read the SMS message. The presence of the event context 2706 guides the NLP component in performing step 200, to interpret "that message" as a new SMS message. At time T₆, step 300 can be performed by the task component to invoke an API to read the SMS message to the user. At time T₇, the user makes request with an ambiguous verb ("tell") and name ("Johnny"). The NLP component interprets natural language 200 by resolving these ambiguities using various sources of context 1000 including the event context 2706 received in step 773; this tells the NLP component that the command refers to an SMS message from a person named Johnny. At step T₇ execute flow step 400 is performed, including matching the name 771 by looking up the number to use from the received event context object. Assistant 1002 is thus able to compose a new SMS message and send it to Johnny, as confirmed in step T₈.

[0216] The present invention has been described in particular detail with respect to possible embodiments. Those of skill in the art will appreciate that the invention may be practiced in other embodiments. First, the particular naming of the components, capitalization of terms, the attributes, data structures, or any other programming or structural aspect is not mandatory or significant, and the mechanisms that implement the invention or its features may have different names, formats, or protocols. Further, the system may be implemented via a combination of hardware and software, as described, or entirely in hardware elements, or entirely in software elements. Also, the particular division of functionality between the

various system components described herein is merely exemplary, and not mandatory; functions performed by a single system component may instead be performed by multiple components, and functions performed by multiple components may instead be performed by a single component.

[0217] In various embodiments, the present invention can be implemented as a system or a method for performing the above-described techniques, either singly or in any combination. In another embodiment, the present invention can be implemented as a computer program product comprising a nontransitory computer-readable storage medium and computer program code, encoded on the medium, for causing a processor in a computing device or other electronic device to perform the above-described techniques.

[0218] Reference in the specification to "one embodiment" or to "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiments is included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

[0219] Some portions of the above are presented in terms of algorithms and symbolic representations of operations on data bits within a memory of a computing device. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps (instructions) leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic or optical signals capable of being stored, transferred, combined, compared and otherwise manipulated. It is convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like. Furthermore, it is also convenient at times, to refer to certain arrangements of steps requiring physical manipulations of physical quantities as modules or code devices, without loss of generality.

[0220] It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussion, it is appreciated that throughout the description, discussions utilizing terms such as "processing" or "computing" or "calculating" or "displaying" or "determining" or the like, refer to the action and processes of a computer system, or similar electronic computing module and/or device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system memories or registers or other such information storage, transmission or display devices.

[0221] Certain aspects of the present invention include process steps and instructions described herein in the form of an algorithm. It should be noted that the process steps and instructions of the present invention can be embodied in software, firmware and/or hardware, and when embodied in software, can be downloaded to reside on and be operated from different platforms used by a variety of operating systems.

[0222] The present invention also relates to an apparatus for performing the operations herein. This apparatus may be specially constructed for the required purposes, or it may comprise a general-purpose computing device selectively activated or reconfigured by a computer program stored in the computing device. Such a computer program may be stored in a computer readable storage medium, such as, but is not limited to, any type of disk including floppy disks, optical disks, CD-ROMs, magnetic-optical disks, read-only memories (ROMs), random access memories (RAMs), EPROMs, EEPROMs, magnetic or optical cards, application specific integrated circuits (ASICs), or any type of media suitable for storing electronic instructions, and each coupled to a computer system bus. Further, the computing devices referred to herein may include a single processor or may be architectures employing multiple processor designs for increased computing capability.

[0223] The algorithms and displays presented herein are not inherently related to any particular computing device, virtualized system, or other apparatus. Various general-purpose systems may also be used with programs in accordance with the teachings herein, or it may prove convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these systems will be apparent from the description provided herein. In addition, the present invention is not described with reference to any particular programming language. It will be appreciated that a variety of programming languages may be used to implement the teachings of the present invention as described herein, and any references above to specific languages are provided for disclosure of enablement and best mode of the present invention.

[0224] Accordingly, in various embodiments, the present invention can be implemented as software, hardware, and/or other elements for controlling a computer system, computing device, or other electronic device, or any combination or plurality thereof. Such an electronic device can include, for example, a processor, an input device (such as a keyboard, mouse, touchpad, trackpad, joystick, trackball, microphone, and/or any combination thereof), an output device (such as a screen, speaker, and/or the like), memory, long-term storage (such as magnetic storage, optical storage, and/or the like), and/or network connectivity, according to techniques that are well known in the art. Such an electronic device may be portable or nonportable. Examples of electronic devices that may be used for implementing the invention include: a mobile phone, personal digital assistant, smartphone,

kiosk, desktop computer, laptop computer, tablet computer, consumer electronic device, consumer entertainment device; music player; camera; television; set-top box; electronic gaming unit; or the like. An electronic device for implementing the present invention may use any operating system such as, for example, iOS or MacOS, available from Apple Inc. of Cupertino, California, or any other operating system that is adapted for use on the device.

[0225] While the invention has been described with respect to a limited number of embodiments, those skilled in the art, having benefit of the above description, will appreciate that other embodiments may be devised which do not depart from the scope of the present invention as described herein. In addition, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the claims.

Numbered Aspects of the Invention

1. A computer-implemented method for interpreting user input to perform a task on a computing device having at least one processor, comprising:

at a processor, receiving context information from a context source;
at an output device, prompting a user for input;
at an input device, receiving user input;
at the processor, interpreting the received user input to derive a representation of user intent;
at the processor, identifying at least one task and at least one parameter for the task, based at least in part on the derived representation of user intent;
at the processor, executing the at least one task using the at least one parameter, to derive a result;
at the processor, generating a dialog response based on the derived result; and
at the output device, outputting the generated dialog response;

wherein at least one of the steps of prompting the user for input, interpreting the received user input, identifying the at least one task and at least one parameter for the task, and generating the dialog response is performed using the received context information.

2. The method of 1, wherein the received context information comprises at least one selected from the group consisting of:

application context;

- personal data associated with the user;
data from a database associated with the user;
data obtained from dialog history;
data received from at least one sensor;
application preferences; 5
application usage history;
data describing an event;
data describing an acoustic environment in
which the spoken input is received;
current dialog state; 10
input previously provided by the user;
location;
local time; and
environmental conditions. 15
3. The method of 1, wherein:
- prompting the user comprises prompting the user
via a conversational interface; and
receiving user input comprises receiving user 20
input via the conversational interface by:
- receiving spoken input; and
converting the spoken input to a text representation. 25
4. The method of 3, wherein converting the spoken
input to a text representation comprises:
- generating a plurality of candidate text interpretations 30
of the spoken input; and
ranking at least a subset of the generated candidate
text interpretations;
- wherein at least one of the generating and ranking 35
steps is performed using the received context information.
5. The method of 4, wherein the received context
information used in at least one of the generating 40
and ranking steps comprises at least one selected
from the group consisting of:
- data describing an acoustic environment in 45
which the spoken input is received;
data received from at least one sensor;
vocabulary obtained from a database associated
with the user;
vocabulary associated with application preferences; 50
vocabulary obtained from usage history; and
current dialog state.
6. The method of 1, wherein receiving user input
comprises receiving text input. 55
7. The method of 1, wherein prompting the user comprises
generating at least one prompt based at least
- in part on the received context information.
8. The method of 1, wherein interpreting the received
user input to derive a representation of user intent
comprises performing natural language processing
on the received user input based at least in part on
the received context information.
9. The method of 8, wherein the received context
information used in interpreting the received user input
comprises at least one selected from the group
consisting of:
- data describing an event;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.
10. The method of 1, wherein performing natural language
processing comprises selecting among a plurality
of candidate interpretations of the received user
input using the received context information.
11. The method of 1, wherein performing natural language
processing comprises determining a referent
for at least one pronoun in the received user input.
12. The method of 1, wherein identifying at least one
task and at least one parameter for the task comprises
identifying at least one task and at least one
parameter for the task based at least in part on the
received context information.
13. The method of 12, wherein identifying at least
one task and at least one parameter for the task
based at least in part on the received context information
comprises:
- receiving a plurality of candidate representations 60
of user intent;
determining a preferred interpretation of user intent
based on at least one selected from the
group consisting of:
- at least one domain model;
at least one task flow model; and
at least one dialog flow model.
14. The method of 12, wherein the received context
information used in identifying at least one task and
at least one parameter for the task comprises at least
one selected from the group consisting of:
- data describing an event;

- data from a database associated with the user;
data received from at least one sensor;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.
15. The method of 1, wherein generating a dialog response comprises generating a dialog response based at least in part on the received context information.
16. The method of 15, wherein generating a dialog response based at least in part on the received context information comprises at least one selected from the group consisting of:
- generating a dialog response including a named referent;
generating a dialog response including a symbolic name associated with a telephone number;
determining which of a plurality of names to use for a referent;
determining a level of detail for the generated response; and
filtering a response based on previous output.
17. The method of 15, wherein the received context information used in generating a dialog response comprises at least one selected from the group consisting of:
- data from a database associated with the user;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.
18. The method of 1, wherein the received context information comprises at least one selected from the group consisting of:
- context information stored at a server; and
context information stored at a client.
19. The method of 1, wherein receiving context information from a context source comprises:
- requesting the context information from a context source; and
receiving the context information in response to the request.
20. The method of 1, wherein receiving context information from a context source comprises:
- receiving at least a portion of the context information prior to receiving user input.
21. The method of 1, wherein receiving context information from a context source comprises:
- receiving at least a portion of the context information after receiving user input.
22. The method of 1, wherein receiving context information from a context source comprises:
- receiving static context information as part of an initialization step; and
receiving additional context information after receiving user input.
23. The method of 1, wherein receiving context information from a context source comprises:
- receiving push notification of a change in context information; and
responsive to the push notification, updating locally stored context information.
24. The method of 1, wherein the computing device comprises at least one selected from the group consisting of:
- a telephone;
a smartphone;
a tablet computer;
a laptop computer;
a personal digital assistant;
a desktop computer;
a kiosk;
a consumer electronic device;
a consumer entertainment device;
a music player;
a camera;
a television;
an electronic gaming unit; and
a set-top box.
25. A computer program product for interpreting user input to perform a task on a computing device having at least one processor, comprising:
- a nontransitory computer-readable storage medium; and
computer program code, encoded on the medium, configured to cause at least one processor to perform the steps of:
- receiving context information from a context

source;
 causing an output device to prompt a user
 for input;
 receiving user input via an input device;
 interpreting the received user input to derive
 a representation of user intent; 5
 identifying at least one task and at least one
 parameter for the task, based at least in part
 on the derived representation of user intent;
 executing the at least one task using the at
 least one parameter, to derive a result; 10
 generating a dialog response based on the
 derived result; and
 causing the output device to output the gen-
 erated dialog response; 15

wherein the computer program code is configured
 to cause at least one processor to perform at least
 one of the steps of causing the output device to
 prompt the user for input, interpreting the receiving
 user input, identifying the at least one task and at
 least one parameter for the task, and generating the
 dialog response using the received context informa-
 tion. 20

26. The computer program product of 25, wherein
 the received context information comprises at least
 one selected from the group consisting of:

application context; 30
 personal data associated with the user;
 data from a database associated with the user;
 data obtained from dialog history;
 data received from at least one sensor;
 application preferences; 35
 application usage history;
 data describing an event;
 data describing an acoustic environment in
 which the spoken input is received;
 current dialog state; 40
 input previously provided by the user;
 location;
 local time; and
 environmental conditions. 45

27. The computer program product of 25, wherein:

the computer program code configured to cause
 an output device to prompt the user comprises
 computer program code configured to cause an
 output device to prompt the user via a conver-
 sational interface; and
 the computer program code configured to cause
 at least one processor to receive user input com-
 prises computer program code configured to 55
 cause at least one processor to receive user in-
 put via the conversational interface.

28. The computer program product of 25, wherein
 the computer program code configured to cause at
 least one processor to receive user input comprises:

computer program code configured to cause at
 least one processor to receive spoken input; and
 computer program code configured to cause at
 least one processor to convert the spoken input
 to a text representation by:

generating a plurality of candidate text in-
 terpretations of the spoken input; and
 ranking at least a subset of the generated
 candidate text interpretations;

wherein at least one of the generating and ranking
 steps is performed using the received context infor-
 mation.

29. The computer program product of 28, wherein
 the received context information used in at least one
 of the generating and ranking steps comprises at
 least one selected from the group consisting of:

data describing an acoustic environment in
 which the spoken input is received;
 data received from at least one sensor;
 vocabulary obtained from a database associat-
 ed with the user;
 vocabulary associated with application prefer-
 ences;
 vocabulary obtained from usage history; and
 current dialog state.

30. The computer program product of 25, wherein
 the computer program code configured to cause at
 least one processor to prompt the user comprises
 computer program code configured to cause at least
 one processor to generate at least one prompt based
 at least in part on the received context information.

31. The computer program product of 25, wherein
 the computer program code configured to cause at
 least one processor to interpret the received user
 input to derive a representation of user intent com-
 prises computer program code configured to cause
 at least one processor to perform natural language
 processing on the received user input based at least
 in part on the received context information.

32. The computer program product of 31, wherein
 the received context information used in interpreting
 the received user input comprises at least one se-
 lected from the group consisting of:

data describing an event;
 application context;
 input previously provided by the user;

- known information about the user;
location;
date;
environmental conditions; and
history. 5
33. The computer program product of 25, wherein the computer program code configured to cause at least one processor to identify at least one task and at least one parameter for the task comprises computer program code configured to cause at least one processor to identify at least one task and at least one parameter for the task based at least in part on the received context information. 10
34. The computer program product of 33, wherein the received context information used in identifying at least one task and at least one parameter for the task comprises at least one selected from the group consisting of: 15
- data describing an event;
data from a database associated with the user;
data received from at least one sensor;
application context; 25
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and 30
history.
35. The computer program product of 25, wherein the computer program code configured to cause at least one processor to generate a dialog response comprises computer program code configured to cause at least one processor to generating a dialog response based at least in part on the received context information. 35
36. The computer program product of 35, wherein the received context information used in generating a dialog response comprises at least one selected from the group consisting of: 40
- data from a database associated with the user;
application context;
input previously provided by the user;
known information about the user;
location; 50
date;
environmental conditions; and
history.
37. The computer program product of 25, wherein the computer program code configured to cause at least one processor to receive context information from a context source comprises: 55
- computer program code configured to cause at least one processor to request the context information from a context source; and
computer program code configured to cause at least one processor to receive the context information in response to the request.
38. The computer program product of 25, wherein the computer program code configured to cause at least one processor to receive context information from a context source comprises:
- computer program code configured to cause at least one processor to receive at least a portion of the context information prior to receiving user input.
39. The computer program product of 25, wherein the computer program code configured to cause at least one processor to receive context information from a context source comprises:
- computer program code configured to cause at least one processor to receive at least a portion of the context information after receiving user input.
40. The computer program product of 25, wherein the computer program code configured to cause at least one processor to receive context information from a context source comprises:
- computer program code configured to cause at least one processor to receive static context information as part of an initialization step; and
the computer program code configured to cause at least one processor to receive additional context information after receiving user input.
41. The computer program product of 25, wherein the computer program code configured to cause at least one processor to receive context information from a context source comprises:
- computer program code configured to cause at least one processor to receive push notification of a change in context information; and
computer program code configured to cause at least one processor to, responsive to the push notification, update locally stored context information.
42. A system for interpreting user input to perform a task, comprising:
- an output device, configured to prompt a user for input;
an input device, configured to receive user input;

at least one processor, communicatively coupled to the output device and to the input device, configured to perform the steps of:

receiving context information from a context source;
 interpreting the received user input to derive a representation of user intent;
 identifying at least one task and at least one parameter for the task, based at least in part on the derived representation of user intent;
 executing the at least one task using the at least one parameter, to derive a result; and
 generating a dialog response based on the derived result;

wherein the output device is further configured to output the generated dialog response;
 and wherein at least one of prompting the user for input, interpreting the received user input, identifying the at least one task and at least one parameter for the task, and generating the dialog response is performed using the received context information.

43. The system of 42, wherein the received context information comprises at least one selected from the group consisting of:

application context;
 personal data associated with the user;
 data from a database associated with the user;
 data obtained from dialog history;
 data received from at least one sensor;
 application preferences;
 application usage history;
 data describing an event;
 data describing an acoustic environment in which the spoken input is received;
 current dialog state;
 input previously provided by the user;
 location;
 local time; and
 environmental conditions.

44. The system of 42, wherein:

the output device is configured to prompt the user via a conversational interface; and
 the input device is configured to receive user input via the conversational interface by receiving spoken input;
 and wherein the at least one processor is configured to convert the spoken input to a text representation.

45. The system of 44, wherein the at least one processor is configured to convert the spoken input to a text representation by:

generating a plurality of candidate text interpretations of the spoken input; and
 ranking at least a subset of the generated candidate text interpretations;

wherein at least one of the generating and ranking steps is performed using the received context information.

46. The system of 45, wherein the received context information used in at least one of the generating and ranking comprises at least one selected from the group consisting of:

data describing an acoustic environment in which the spoken input is received;
 data received from at least one sensor;
 vocabulary obtained from a database associated with the user;
 vocabulary associated with application preferences;
 vocabulary obtained from usage history; and
 current dialog state.

47. The system of 42, wherein the output device is configured to prompt the user by generating at least one prompt based at least in part on the received context information.

48. The system of 42, wherein the at least one processor is configured to interpret the received user input to derive a representation of user intent by performing natural language processing on the received user input based at least in part on the received context information.

49. The system of 48, wherein the received context information used in interpreting the received user input comprises at least one selected from the group consisting of:

data describing an event;
 application context;
 input previously provided by the user;
 known information about the user;
 location;
 date;
 environmental conditions; and
 history.

50. The system of 42, wherein the at least one processor is configured to identify at least one task and at least one parameter for the task by identifying at least one task and at least one parameter for the task based at least in part on the received context information.

51. The system of 50, wherein the received context

information used in identifying at least one task and at least one parameter for the task comprises at least one selected from the group consisting of:

data describing an event;
data from a database associated with the user;
data received from at least one sensor;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.

52. The system of 42, wherein the at least one processor is configured to generate a dialog response by generating a dialog response based at least in part on the received context information.

53. The system of 52, wherein the received context information used in generating a dialog response comprises at least one selected from the group consisting of:

data from a database associated with the user;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.

54. The system of 42, wherein the received context information comprises at least one selected from the group consisting of:

context information stored at a server; and
context information stored at a client.

55. The system of 42, wherein the at least one processor is configured to receive context information from a context source by:

requesting the context information from a context source; and
receiving the context information in response to the request.

56. The system of 42, wherein the at least one processor is configured to receive context information from a context source by:

receiving at least a portion of the context information prior to receiving user input.

57. The system of 42, wherein the at least one proc-

essor is configured to receive context information from a context source by:

receiving at least a portion of the context information after receiving user input.

58. The system of 42, wherein the at least one processor is configured to receive context information from a context source by:

receiving static context information as part of an initialization step; and
receiving additional context information after receiving user input.

59. The system of 42, wherein the at least one processor is configured to receive context information from a context source by:

receiving push notification of a change in context information; and
responsive to the push notification, updating locally stored context information.

60. The system of 42, wherein the output device, input device, and at least one processor are implemented as components of at least one selected from the group consisting of:

a telephone;
a smartphone;
a tablet computer;
a laptop computer;
a personal digital assistant;
a desktop computer;
a kiosk;
a consumer electronic device;
a consumer entertainment device;
a music player;
a camera;
a television;
an electronic gaming unit; and
a set-top box.

Claims

1. A system for interpreting user input to perform a task, comprising:

an output device, configured to prompt a user for input;
an input device, configured to receive user input;
at least one processor, communicatively coupled to the output device and to the input device, configured to perform the steps of:

receiving context information from a context

source;
 interpreting the received user input to derive
 a representation of user intent;
 identifying at least one task and at least one
 parameter for the task, based at least in part
 on the derived representation of user intent;
 executing the at least one task using the at
 least one parameter, to derive a result; and
 generating a dialog response based on the
 derived result;

wherein the output device is further configured
 to output the generated dialog response;
 and wherein at least one of prompting the user
 for input, interpreting the receiving user input,
 identifying the at least one task and at least one
 parameter for the task, and generating the dialog
 response is performed using the received con-
 text information.

2. The system of claim 1, wherein the received context
 information comprises at least one selected from the
 group consisting of:

application context;
 personal data associated with the user;
 data from a database associated with the user;
 data obtained from dialog history;
 data received from at least one sensor;
 application preferences;
 application usage history;
 data describing an event;
 data describing an acoustic environment in
 which the spoken input is received;
 current dialog state;
 input previously provided by the user;
 location;
 local time; and
 environmental conditions.

3. The system of any proceeding claim 1, wherein:

the output device is configured to prompt the
 user via a conversational interface; and
 the input device is configured to receive user
 input via the conversational interface by receiv-
 ing spoken input;
 and wherein the at least one processor is con-
 figured to convert the spoken input to a text rep-
 resentation.

4. The system of any proceeding claim 3, wherein the
 at least one processor is configured to convert the
 spoken input to a text representation by:

generating a plurality of candidate text interpre-
 tations of the spoken input; and
 ranking at least a subset of the generated can-

didate text interpretations;

wherein at least one of the generating and ranking
 steps is performed using the received context infor-
 mation.

5. The system of claim 4, wherein the received context
 information used in at least one of the generating
 and ranking comprises at least one selected from
 the group consisting of:

data describing an acoustic environment in
 which the spoken input is received;
 data received from at least one sensor;
 vocabulary obtained from a database associat-
 ed with the user;
 vocabulary associated with application prefer-
 ences;
 vocabulary obtained from usage history; and
 current dialog state.

6. The system of any proceeding claim 1, wherein the
 output device is configured to prompt the user by
 generating at least one prompt based at least in part
 on the received context information.

7. The system of any proceeding claim 1, wherein the
 at least one processor is configured to interpret the
 received user input to derive a representation of user
 intent by performing natural language processing on
 the received user input based at least in part on the
 received context information.

8. The system of claim 7, wherein the received context
 information used in interpreting the received user
 input comprises at least one selected from the group
 consisting of:

data describing an event;
 application context;
 input previously provided by the user;
 known information about the user;
 location;
 date;
 environmental conditions; and
 history.

9. The system of any proceeding claim 1, wherein the
 at least one processor is configured to identify at
 least one task and at least one parameter for the
 task by identifying at least one task and at least one
 parameter for the task based at least in part on the
 received context information.

10. The system of claim 9, wherein the received context
 information used in identifying at least one task and
 at least one parameter for the task comprises at least
 one selected from the group consisting of:

- data describing an event;
data from a database associated with the user;
data received from at least one sensor;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.
11. The system of any proceeding claim 1, wherein the at least one processor is configured to generate a dialog response by generating a dialog response based at least in part on the received context information.
12. The system of claim 11, wherein the received context information used in generating a dialog response comprises at least one selected from the group consisting of:
- data from a database associated with the user;
application context;
input previously provided by the user;
known information about the user;
location;
date;
environmental conditions; and
history.
13. The system of any proceeding claim 1, wherein the received context information comprises at least one selected from the group consisting of:
- context information stored at a server; and
context information stored at a client.
14. The system of any proceeding claim 1, wherein the at least one processor is configured to receive context information from a context source by:
- requesting the context information from a context source; and
receiving the context information in response to the request.
15. The system of any proceeding claim 1, wherein the at least one processor is configured to receive context information from a context source by:
- receiving at least a portion of the context information prior to receiving user input.
16. The system of any proceeding claim 1, wherein the at least one processor is configured to receive context information from a context source by:
- receiving at least a portion of the context information after receiving user input.
17. The system of any proceeding claim 1, wherein the at least one processor is configured to receive context information from a context source by:
- receiving static context information as part of an initialization step; and
receiving additional context information after receiving user input.
18. The system of any proceeding claim 1, wherein the at least one processor is configured to receive context information from a context source by:
- receiving push notification of a change in context information; and
responsive to the push notification, updating locally stored context information.
19. The system of any proceeding claim 1, wherein the output device, input device, and at least one processor are implemented as components of at least one selected from the group consisting of:
- a telephone;
a smartphone;
a tablet computer;
a laptop computer;
a personal digital assistant;
a desktop computer;
a kiosk;
a consumer electronic device;
a consumer entertainment device;
a music player;
a camera;
a television;
an electronic gaming unit; and
a set-top box.

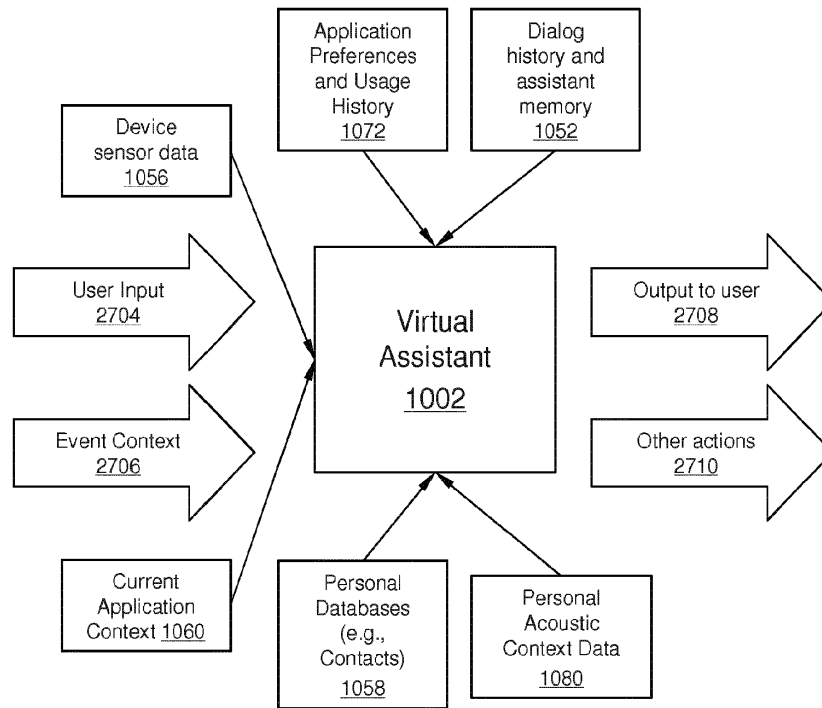


FIG. 1

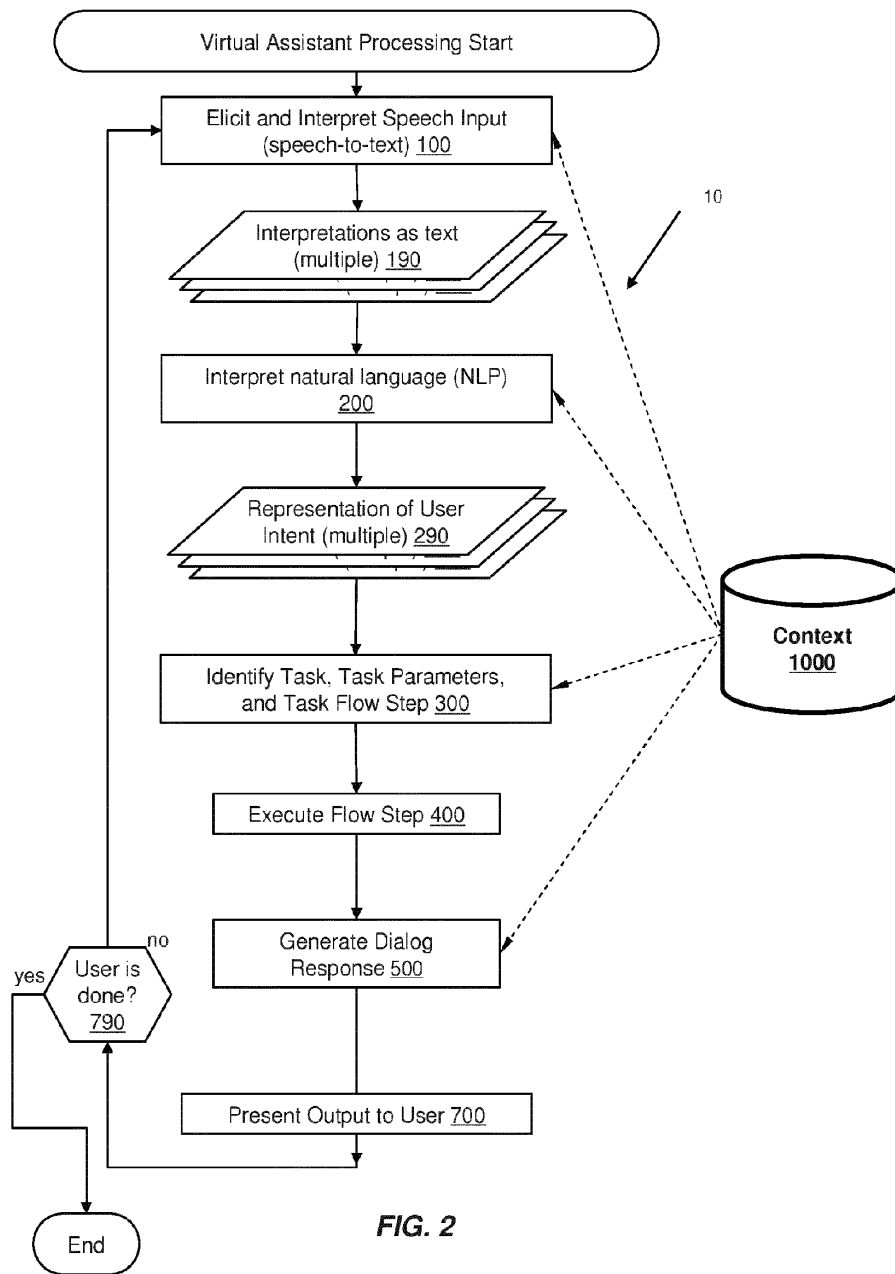
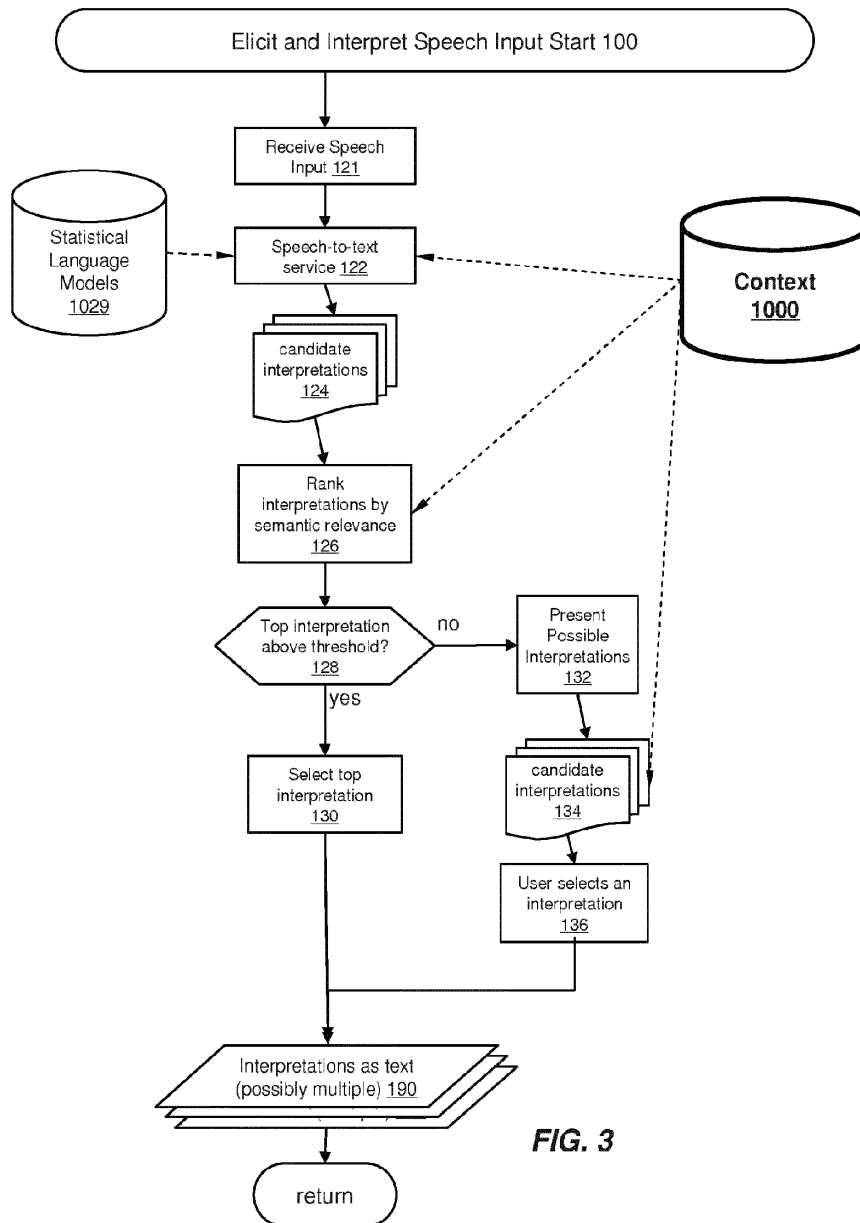


FIG. 2



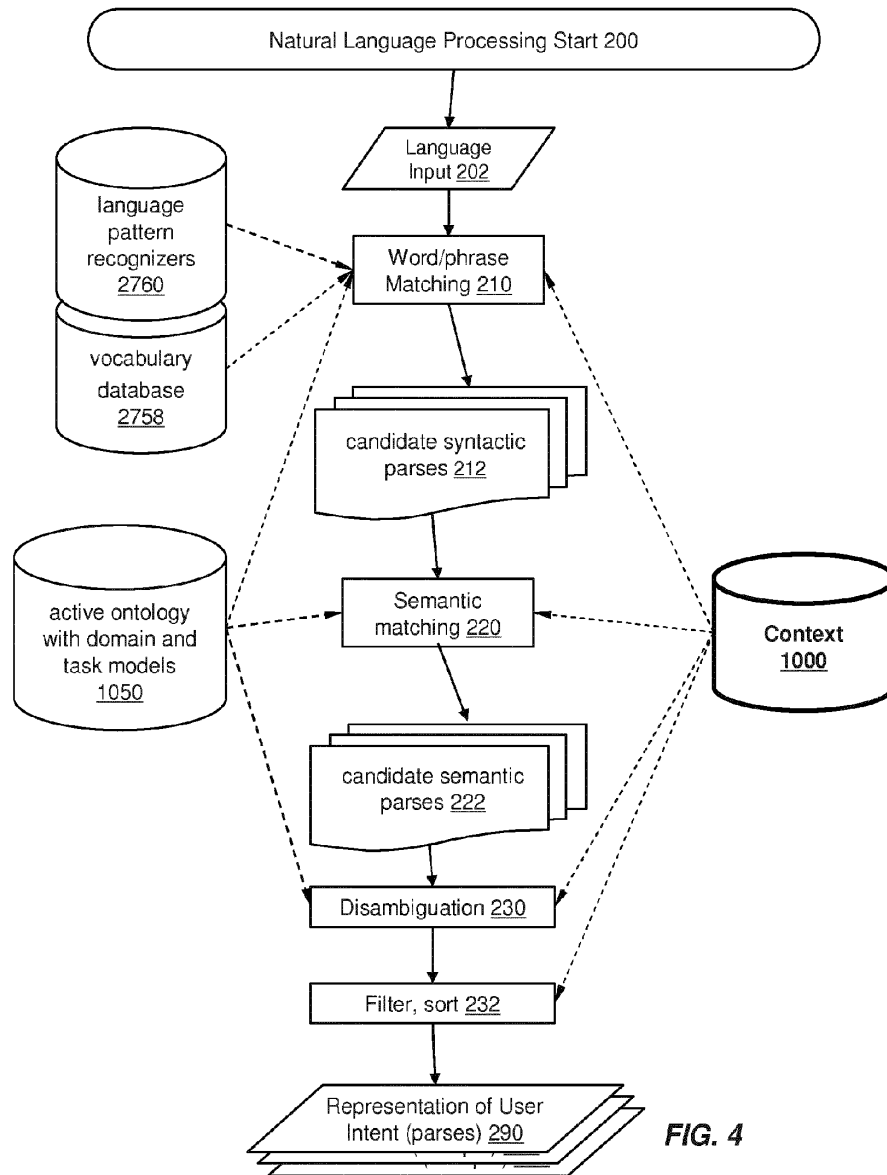


FIG. 4

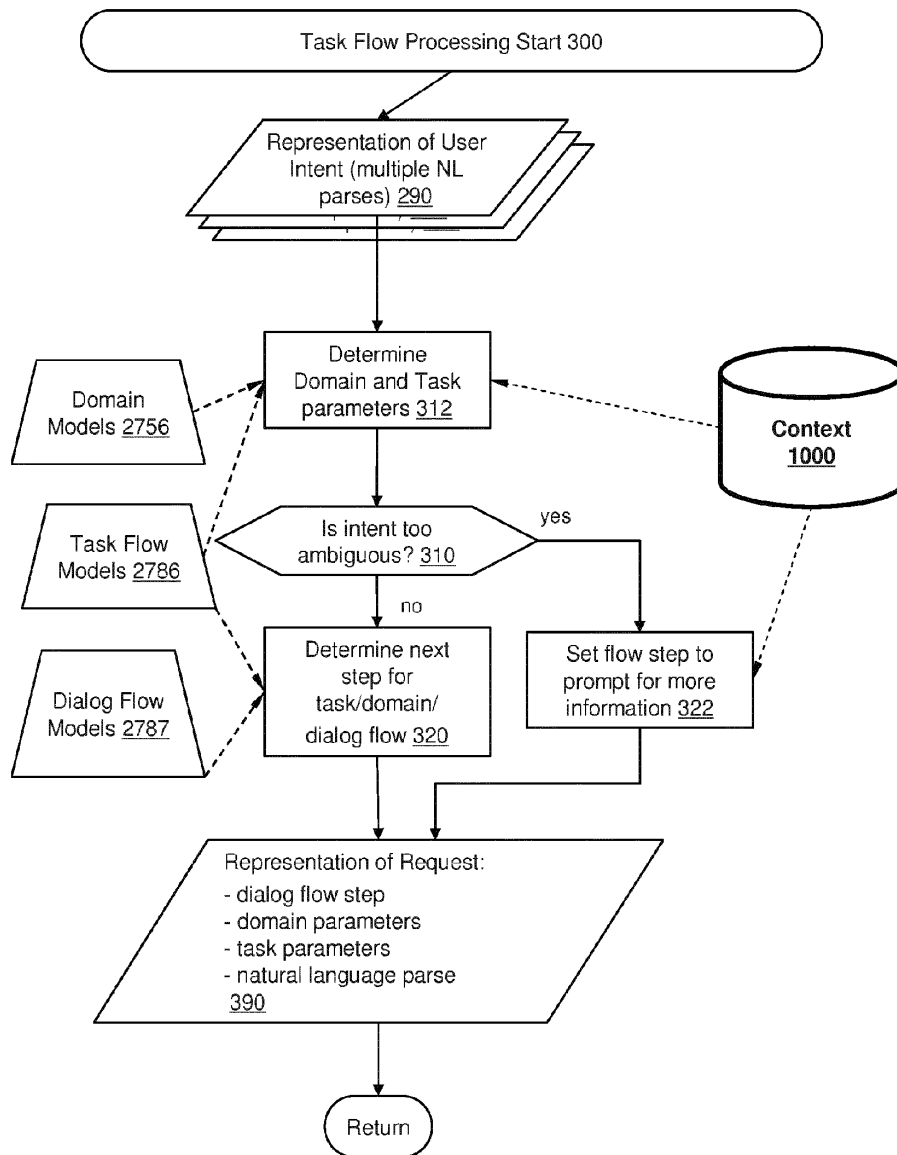


FIG. 5

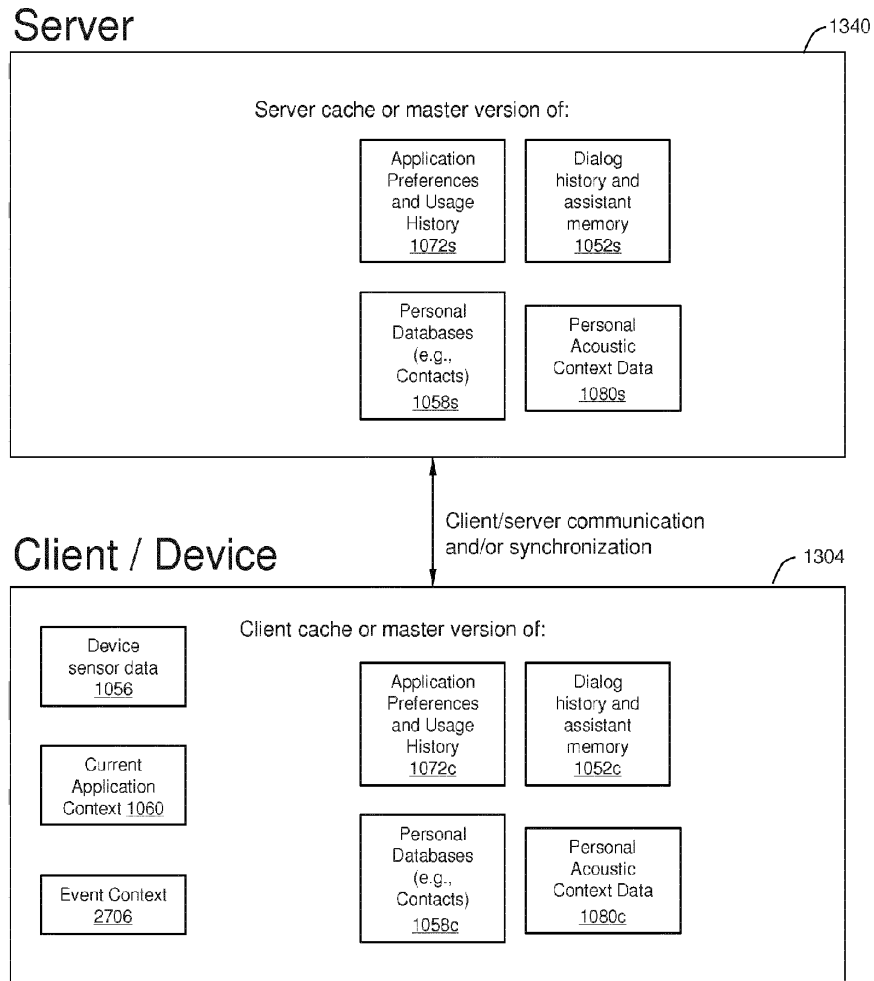
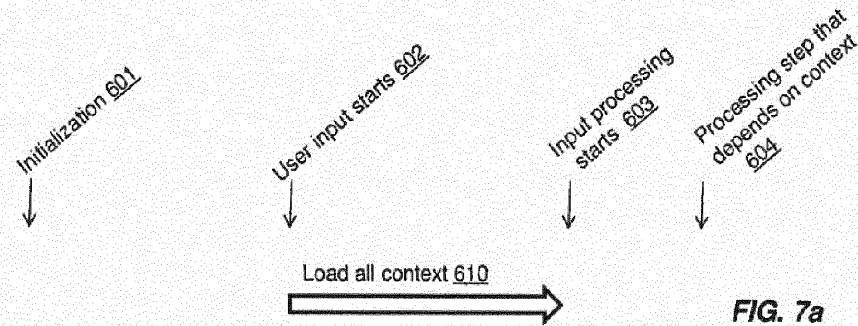
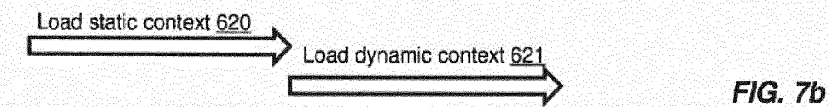
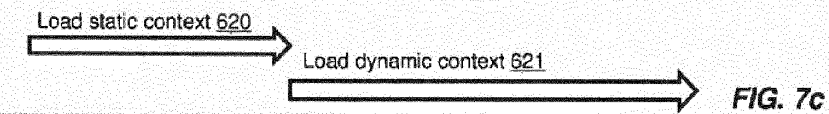
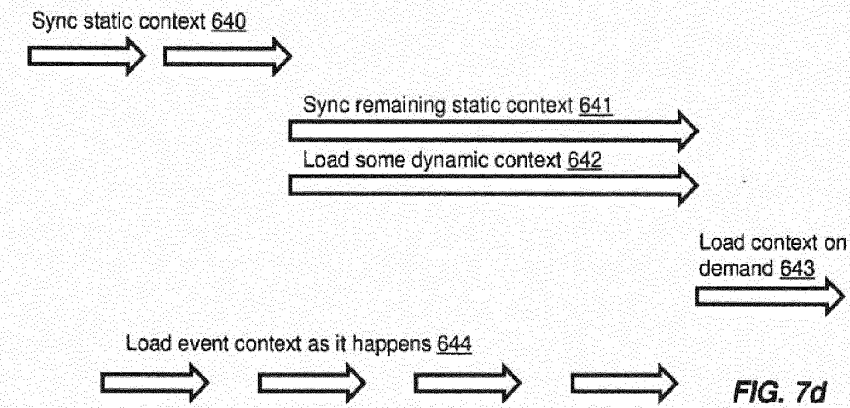
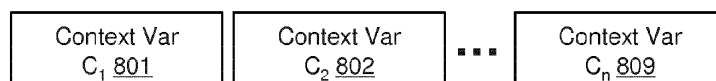
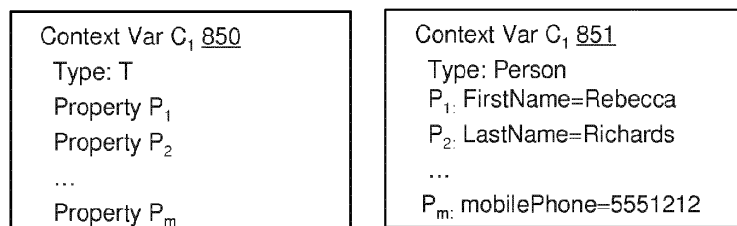
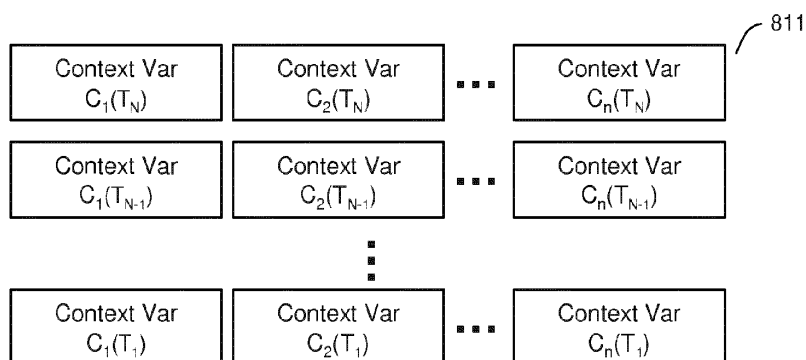
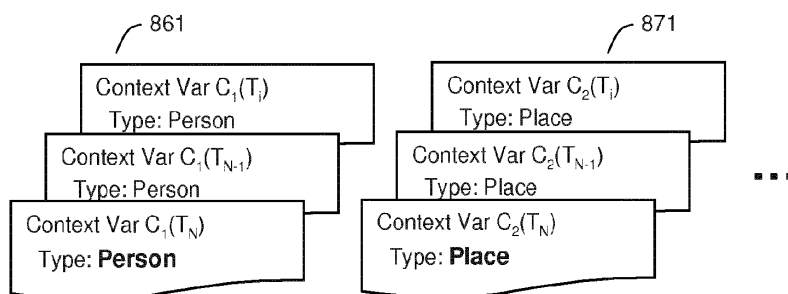


FIG. 6

Context Communication and Coordination



**FIG. 8a****FIG. 8b****FIG. 8c****FIG. 8d**

900

Context Source	Speech <u>100</u>	NLP <u>200</u>	Task <u>300</u>	Dialog <u>500</u>
User name	Sync	Sync	Sync	Sync
Address book – names	Sync	Sync	Sync	-
Address book – numbers	-	-	On demand	-
SMS Event context	-	Push	Push	-
Calendar database	-	On demand	On demand	-

FIG. 9

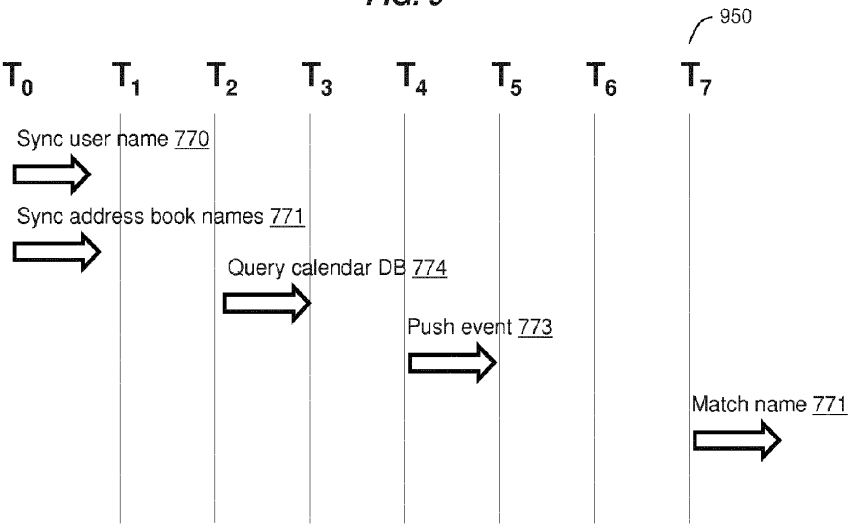


FIG. 10



FIG. 11



FIG. 12

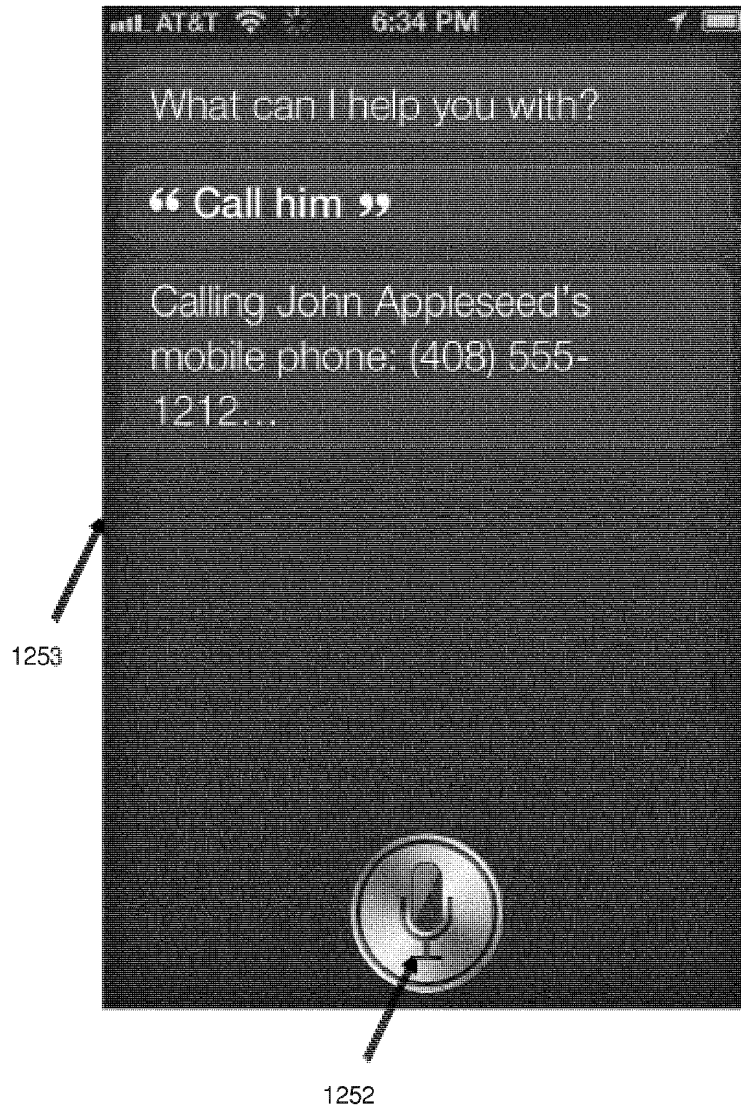


FIG. 13

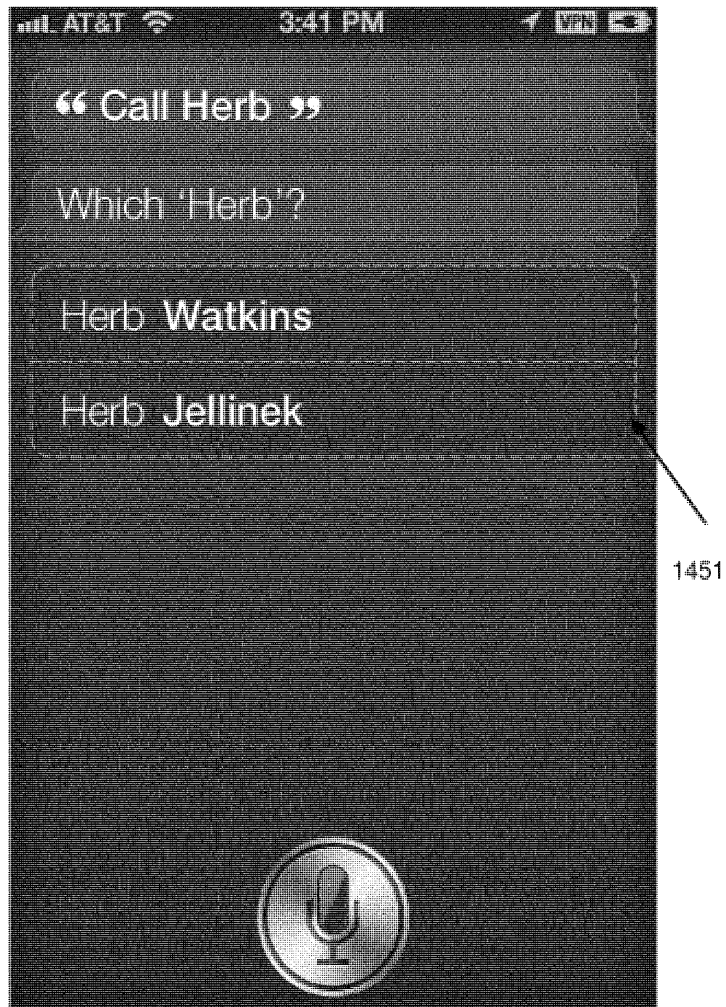


FIG. 14



FIG. 15

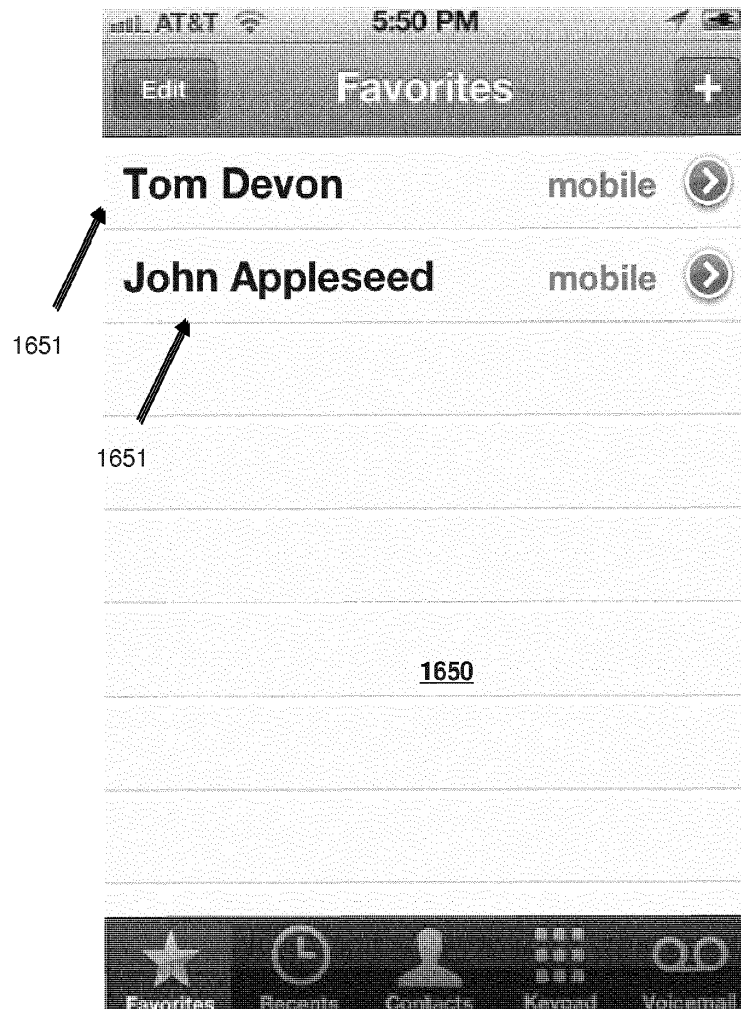


FIG. 16



FIG. 17

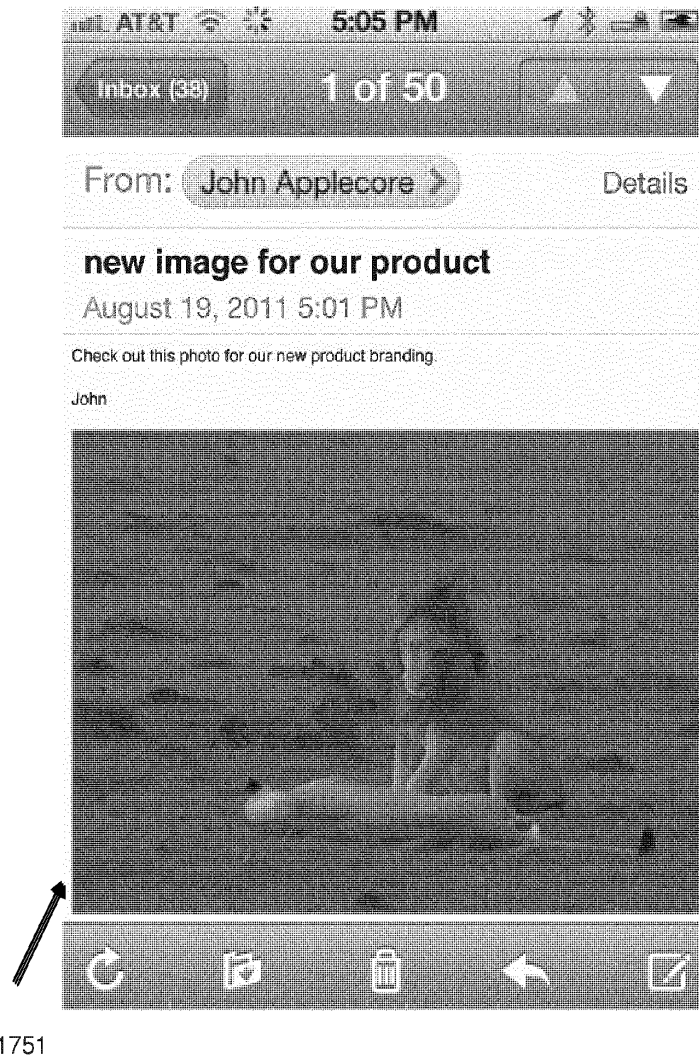


FIG. 18



FIG. 19



FIG. 20



FIG. 21



FIG. 22



FIG. 23

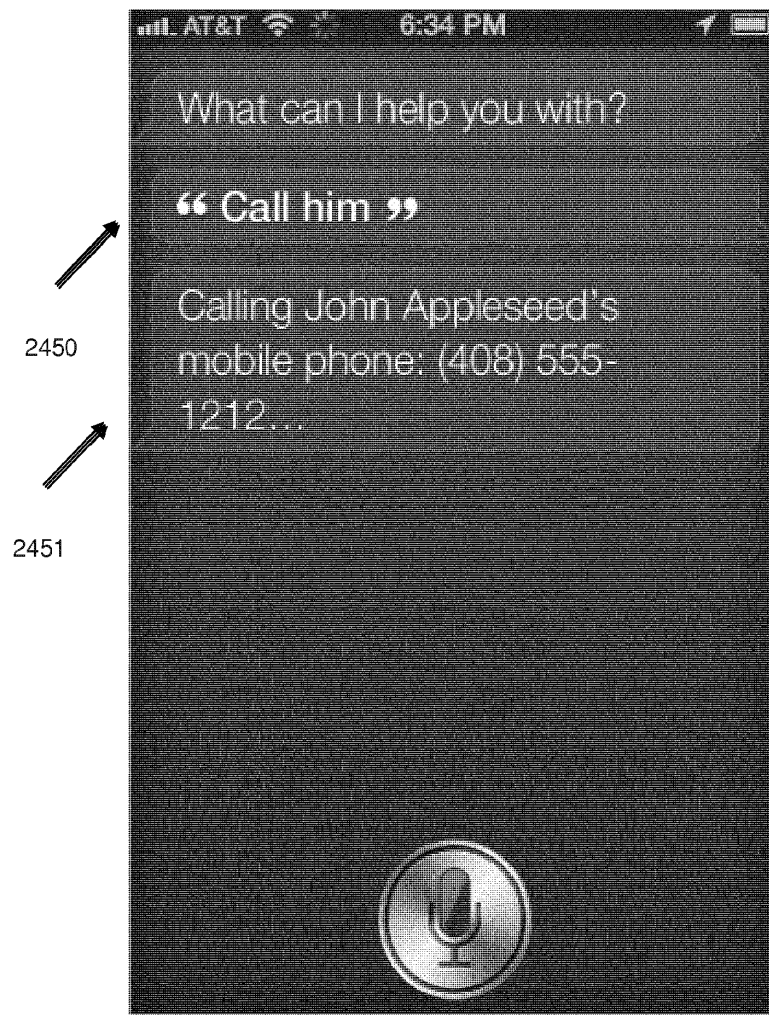


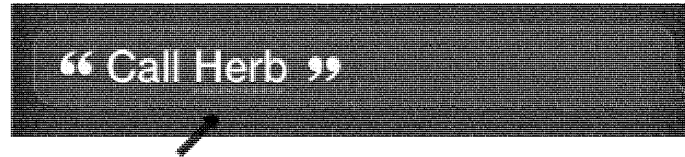
FIG. 24



FIG. 25A



FIG. 25B



2651

FIG. 26A

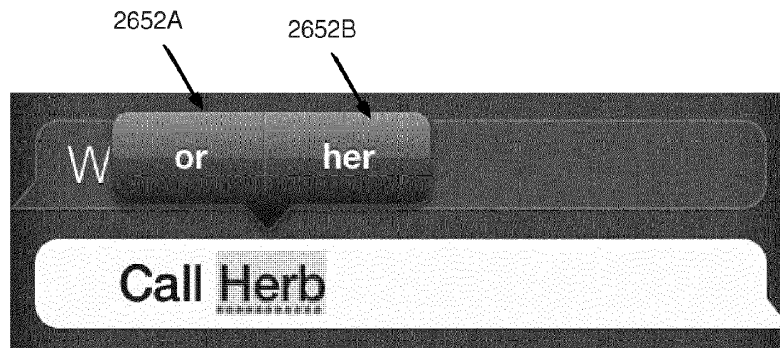


FIG. 26B

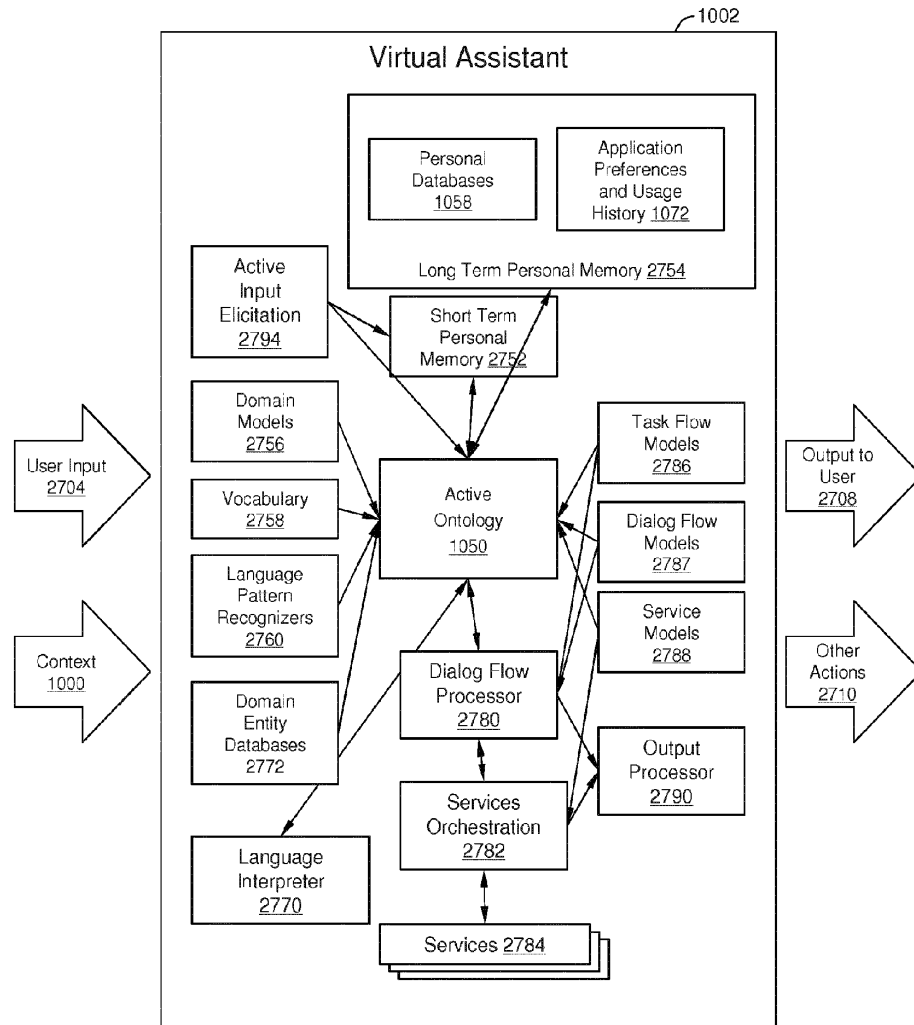


FIG. 27

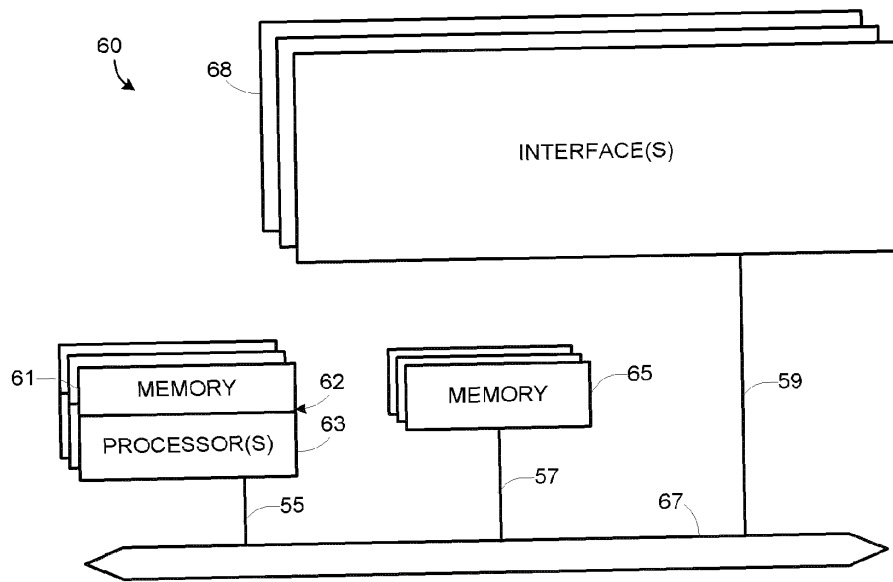


FIG. 28

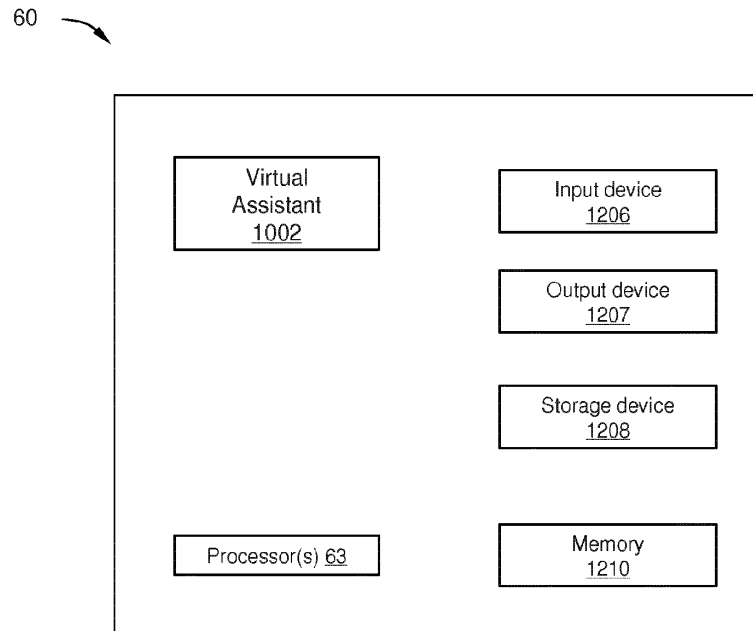


FIG. 29

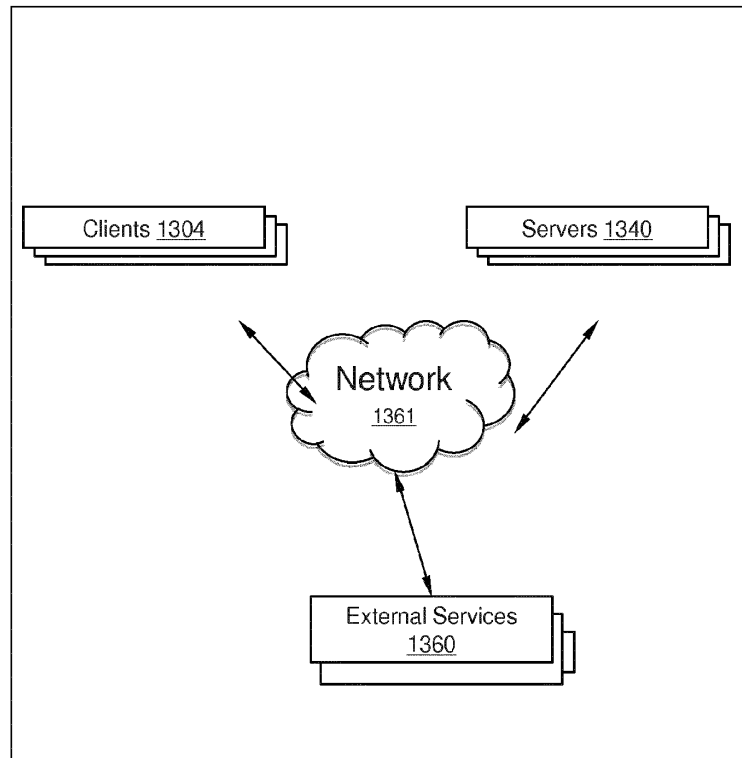


FIG. 30

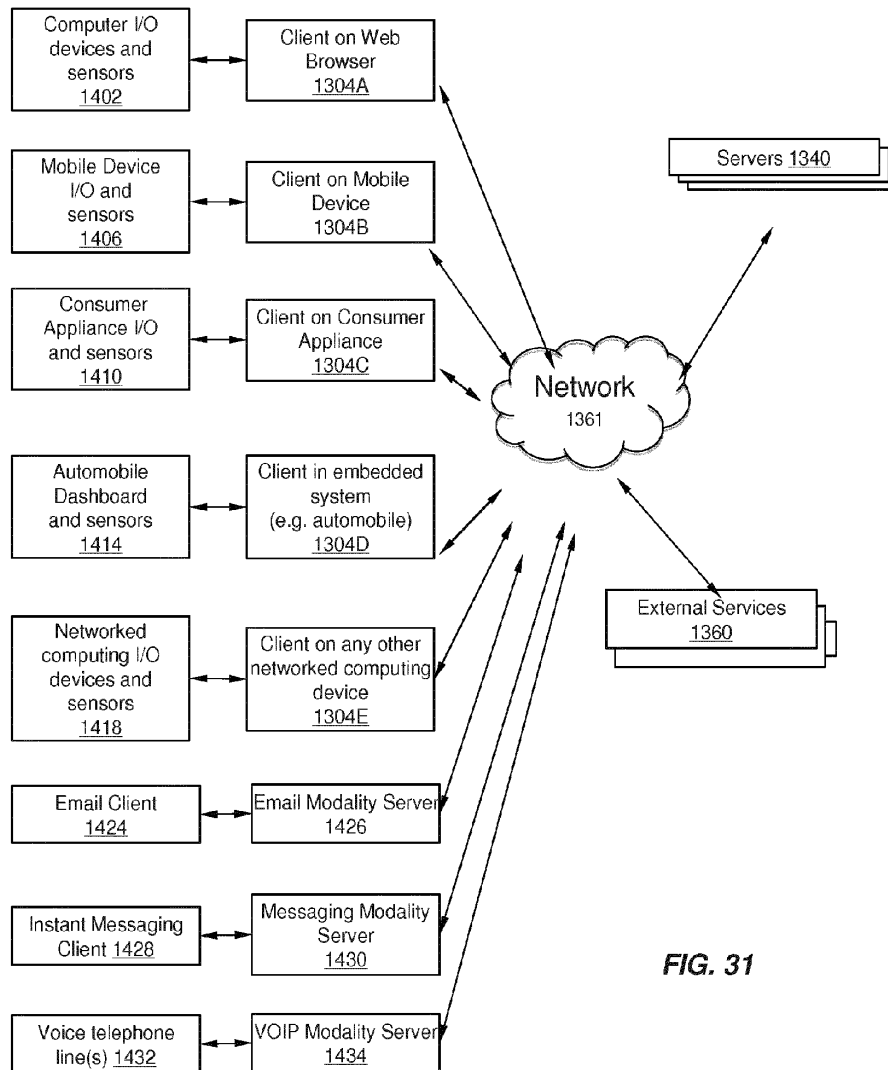


FIG. 31

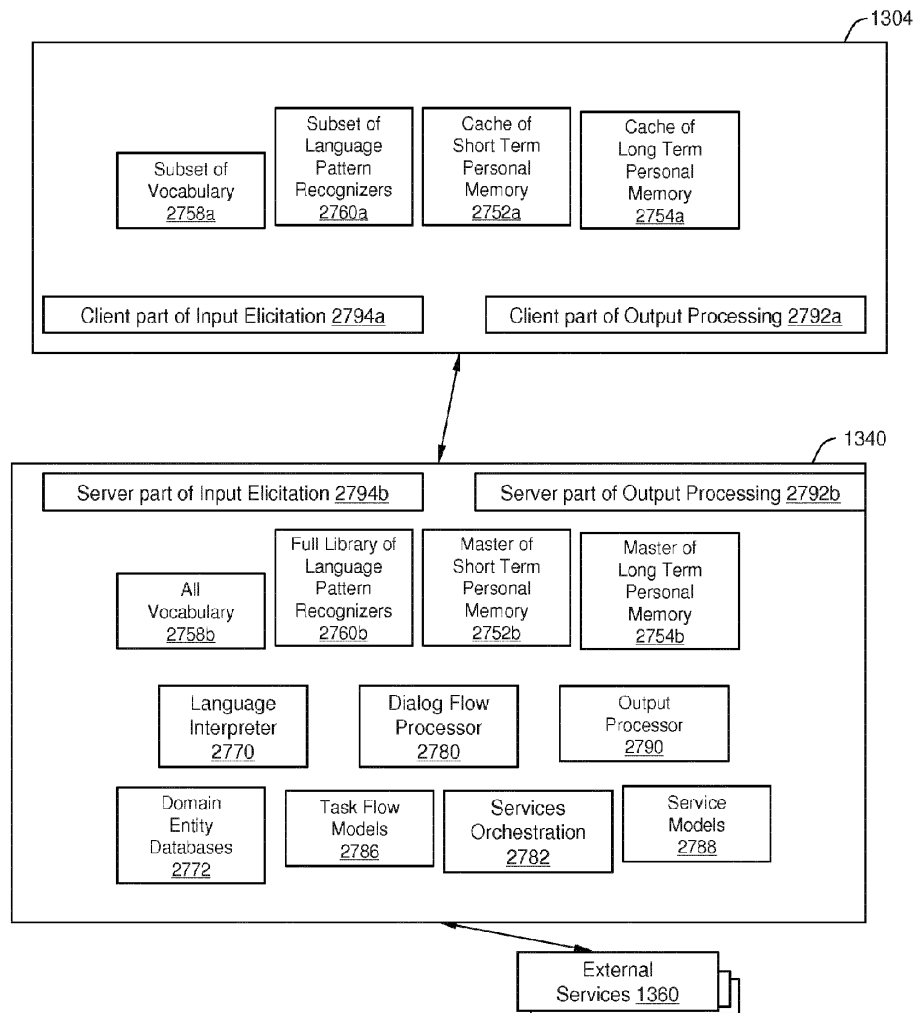


FIG. 32

REFERENCES CITED IN THE DESCRIPTION

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G10L 15/26 (2006.01) G10L 15/22 (2006.01)
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(74) Agents: ARJOMAND, Mehran et al.; Morrison & Foerster LLP, 755 Page Mill Road, Palo Alto, CA 94304-1018 (US).

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(71) Applicant: APPLE INC. [US/US]; 1 Infinite Loop, Cupertino, CA 95014 (US).

(72) Inventors: GRUBER, Thomas, R.; C/o Apple Inc., 1 Infinite Loop, Cupertino, CA 95014 (US). SADDLER, Harry, J.; C/o Apple Inc., 1 Infinite Loop, Cupertino, CA 95014 (US). BELLEGARDA, Jerome, R.; 14118 Shadow Oak Way, Saratoga, CA 95070 (US). NYEGGEN, Bryce, H.; C/o Apple Inc., 1 Infinite Loop, Cupertino, CA 95014 (US). SABATELLI, Alessandro; 463 Ellsworth St., San Francisco, CA 94110 (US).

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Published:

— with international search report (Art. 21(3))

(54) Title: MULTI-COMMAND SINGLE UTTERANCE INPUT METHOD

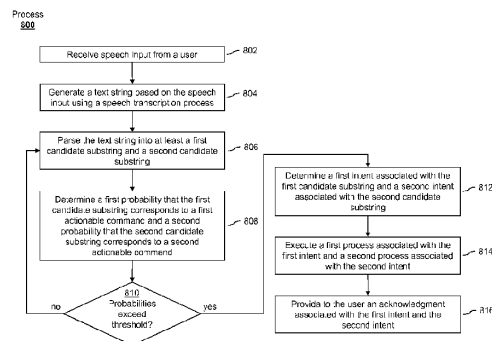


FIG. 8

(57) Abstract: Systems and processes are disclosed for handling a multi-part voice command for a virtual assistant. Speech input can be received from a user that includes multiple actionable commands within a single utterance. A text string can be generated from the speech input using a speech transcription process. The text string can be parsed into multiple candidate substrings based on domain keywords, imperative verbs, predetermined substring lengths, or the like. For each candidate substring, a probability can be determined indicating whether the candidate substring corresponds to an actionable command. Such probabilities can be determined based on semantic coherence, similarity to user request templates, querying services to determine manageability, or the like. If the probabilities exceed a threshold, the user intent of each substring can be determined, processes associated with the user intents can be executed, and an acknowledgment can be provided to the user.

MULTI-COMMAND SINGLE UTTERANCE INPUT METHOD

Cross-Reference to Related Application

[0001] This application claims the benefit of priority of U.S. Provisional Patent Application No. 62/005,556, entitled “MULTI-COMMAND SINGLE UTTERANCE INPUT METHOD”, filed May 30, 2014; and U.S. Provisional Patent Application No. 62/129,851, entitled “MULTI-COMMAND SINGLE UTTERANCE INPUT METHOD” filed March 8, 2015. The content of these applications is hereby incorporated by reference in its entirety.

Field

[0002] This relates generally to speech processing for a virtual assistant and, more specifically, to processing a single utterance having multiple actionable commands for a virtual assistant.

Background

[0003] Intelligent automated assistants (or virtual assistants) provide an intuitive interface between users and electronic devices. These assistants can allow users to interact with devices or systems using natural language in spoken and/or text forms. For example, a user can access the services of an electronic device by providing a spoken user input in natural language form to a virtual assistant associated with the electronic device. The virtual assistant can perform natural language processing on the spoken user input to infer the user's intent and operationalize the user's intent into tasks. The tasks can then be performed by executing one or more functions of the electronic device, and a relevant output can be returned to the user in natural language form.

[0004] While electronic user devices continue to provide enhanced functionality, however, some users can get overwhelmed with notifications, announcements, messages, reminders, or the like. Moreover, it can be inefficient and time consuming for users to deal with each notification, announcement, message, or reminder individually. For example, using speech to interact with a virtual assistant, a user can typically address only a single item, function, or activity at one time. In addition,

users may need to wait for a virtual assistant task to be completed before moving on to another task. Such delays, in addition to limiting efficiency, can also break user concentration, which can cause users to forget other items they may have had in mind.

[0005] Accordingly, in some instances, it can be time consuming, inefficient, and frustrating for users to deal with multiple tasks—one at a time—using speech to interact with a virtual assistant.

Summary

[0006] Systems and processes are disclosed for processing a multi-part voice command. In one example, speech input can be received from a user that includes a single utterance having one or more actionable commands. A text string can be generated based on the speech input using a speech transcription process. The text string can be parsed into multiple candidate substrings. Probabilities can be determined for each of the candidate substrings indicating whether they are likely to correspond to actionable commands. In response to the probabilities exceeding a threshold, user intents can be determined for each of the candidate substrings. Processes associated with the user intents can then be executed. An acknowledgment can also be provided to the user associated with the various user intents.

[0007] In some examples, the text string can be parsed by identifying domain keywords. In other examples, the text string can be parsed by identifying imperative verbs. The probability that a substring corresponds to an actionable command can be determined by determining a semantic coherence of the substring. The probability can also be determined by comparing the substring to user request templates. The probability can also be determined by submitting the substring to a service and receiving a likelihood that the service can resolve an actionable command from the substring.

[0008] In addition, in some examples, user intent for a substring can be determined based on words in a previous substring. User intent can also be determined based on displayed information. Displayed information can include a list, and user intent can be determined based on ordinal descriptors associated with items in the list. Displayed information can include notifications and emails. User intent can also be determined by determining potential user requests based on displayed information.

[0009] Moreover, in some examples, an acknowledgment can include an audible confirmation or haptic feedback. Providing an acknowledgment can also include providing tasks associated with user intents, including displaying the tasks. Providing an acknowledgment can also include providing a completion indicator, including displaying a completion indicator like a checkmark. Providing an acknowledgment can also include providing a status indicator, including displaying a status indicator like an hourglass or a status bar. In other examples, providing an acknowledgement can include displaying different candidate substrings using different forms of emphasis, such as bold text, italic text, underlined text, circled text, outlined text, colored text, and/or clustered text.

Brief Description of the Drawings

[0010] For a better understanding of the various described embodiments, reference should be made to the Description of Embodiments below, in conjunction with the following drawings in which like reference numerals refer to corresponding parts throughout the figures.

[0011] FIG. 1 is a block diagram illustrating a system and environment for implementing a digital assistant according to various examples.

[0012] FIG. 2A is a block diagram illustrating a portable multifunction device implementing the client-side portion of a digital assistant in accordance with some embodiments.

[0013] FIG. 2B is a block diagram illustrating exemplary components for event handling according to various examples.

[0014] FIG. 3 illustrates a portable multifunction device implementing the client-side portion of a digital assistant according to various examples.

[0015] FIG. 4 is a block diagram of an exemplary multifunction device with a display and a touch-sensitive surface according to various examples.

[0016] FIG. 5A illustrates an exemplary user interface for a menu of applications on a portable multifunction device according to various examples.

[0017] FIG. 5B illustrates an exemplary user interface for a multifunction device

with a touch-sensitive surface that is separate from the display according to various examples.

[0018] FIG. 6A illustrates a personal electronic device according to various examples.

[0019] FIG. 6B is a block diagram illustrating a personal electronic device according to various examples.

[0020] FIG. 7A is a block diagram illustrating a digital assistant system or a server portion thereof according to various examples.

[0021] FIG. 7B illustrates the functions of the digital assistant shown in FIG. 7A according to various examples.

[0022] FIG. 7C illustrates a portion of an ontology according to various examples.

[0023] FIG. 8 illustrates an exemplary process for handling multiple actionable commands in a single user utterance.

[0024] FIG. 9 illustrates an exemplary parsed multi-part voice command.

[0025] FIG. 10 illustrates an exemplary display with context for interpreting a multi-part voice command.

[0026] FIG. 11 illustrates an exemplary display with multiple notifications of various types usable as context for interpreting a multi-part voice command.

[0027] FIG. 12 illustrates an exemplary display with an email application usable as context for interpreting a multi-part voice command.

[0028] FIG. 13 illustrates an exemplary user interface for conveying the status of a multi-part voice command.

[0029] FIG. 14A and FIG. 14B illustrate exemplary user interfaces for conveying recognition of a multi-part voice command.

[0030] FIG. 15 illustrates a functional block diagram of an electronic device configured to process a multi-part voice command according to various examples.

Description of Embodiments

[0031] In the following description of examples, reference is made to the accompanying drawings in which it is shown by way of illustration specific examples that can be practiced. It is to be understood that other examples can be used and structural changes can be made without departing from the scope of the various examples.

[0032] Below, FIGS. 2A-2B, 3, 4, 5A-5B, and 6A-6B provide a description of exemplary devices for performing the techniques for processing multi-part voice commands. FIGS. 10-14B illustrate exemplary user interfaces. The user interfaces in the figures are also used to illustrate the processes described below, including the process 800 in FIG. 8.

[0033] Although the following description uses terms “first,” “second,” etc. to describe various elements, these elements should not be limited by the terms. These terms are only used to distinguish one element from another. For example, a first input could be termed a second input, and, similarly, a second input could be termed a first input, without departing from the scope of the various described examples. The first input and the second input can both be outputs and, in some cases, can be separate and different inputs.

[0034] The terminology used in the description of the various described examples herein is for the purpose of describing particular examples only and is not intended to be limiting. As used in the description of the various described examples and the appended claims, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term “and/or” as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms “includes,” “including,” “comprises,” and/or “comprising,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0035] The term “if” may be construed to mean “when” or “upon” or “in response to determining” or “in response to detecting,” depending on the context. Similarly,

the phrase “if it is determined” or “if [a stated condition or event] is detected” may be construed to mean “upon determining” or “in response to determining” or “upon detecting [the stated condition or event]” or “in response to detecting [the stated condition or event],” depending on the context.

1. System and Environment

[0036] FIG. 1 illustrates a block diagram of system 100 according to various examples. In some examples, system 100 can implement a digital assistant. The terms “digital assistant,” “virtual assistant,” “intelligent automated assistant,” or “automatic digital assistant” can refer to any information processing system that interprets natural language input in spoken and/or textual form to infer user intent, and performs actions based on the inferred user intent. For example, to act on an inferred user intent, the system can perform one or more of the following: identifying a task flow with steps and parameters designed to accomplish the inferred user intent, inputting specific requirements from the inferred user intent into the task flow; executing the task flow by invoking programs, methods, services, APIs, or the like; and generating output responses to the user in an audible (e.g., speech) and/or visual form.

[0037] Specifically, a digital assistant can be capable of accepting a user request at least partially in the form of a natural language command, request, statement, narrative, and/or inquiry. Typically, the user request can seek either an informational answer or performance of a task by the digital assistant. A satisfactory response to the user request can be a provision of the requested informational answer, a performance of the requested task, or a combination of the two. For example, a user can ask the digital assistant a question, such as “Where am I right now?” Based on the user’s current location, the digital assistant can answer, “You are in Central Park near the west gate.” The user can also request the performance of a task, for example, “Please invite my friends to my girlfriend’s birthday party next week.” In response, the digital assistant can acknowledge the request by saying “Yes, right away,” and then send a suitable calendar invite on behalf of the user to each of the user’s friends listed in the user’s electronic address book. During performance of a requested task, the digital assistant can sometimes interact with the user in a continuous dialogue involving multiple exchanges of information over an extended period of time. There

are numerous other ways of interacting with a digital assistant to request information or performance of various tasks. In addition to providing verbal responses and taking programmed actions, the digital assistant can also provide responses in other visual or audio forms, e.g., as text, alerts, music, videos, animations, etc.

[0038] As shown in FIG. 1, in some examples, a digital assistant can be implemented according to a client-server model. The digital assistant can include client-side portion 102 (hereafter “DA client 102”) executed on user device 104 and server-side portion 106 (hereafter “DA server 106”) executed on server system 108. DA client 102 can communicate with DA server 106 through one or more networks 110. DA client 102 can provide client-side functionalities such as user-facing input and output processing and communication with DA server 106. DA server 106 can provide server-side functionalities for any number of DA clients 102 each residing on a respective user device 104.

[0039] In some examples, DA server 106 can include client-facing I/O interface 112, one or more processing modules 114, data and models 116, and I/O interface to external services 118. The client-facing I/O interface 112 can facilitate the client-facing input and output processing for DA server 106. One or more processing modules 114 can utilize data and models 116 to process speech input and determine the user’s intent based on natural language input. Further, one or more processing modules 114 perform task execution based on inferred user intent. In some examples, DA server 106 can communicate with external services 120 through network(s) 110 for task completion or information acquisition. I/O interface to external services 118 can facilitate such communications.

[0040] User device 104 can be any suitable electronic device. For example, user device 104 can be a portable multifunctional device (e.g., device 200, described below with reference to FIG. 2A), a multifunctional device (e.g., device 400, described below with reference to FIG. 4), or a personal electronic device (e.g., device 600, described below with reference to FIG. 6A-B.) A portable multifunctional device can be, for example, a mobile telephone that also contains other functions, such as PDA and/or music player functions. Specific examples of portable multifunction devices can include the iPhone®, iPod Touch®, and iPad® devices from Apple Inc. of Cupertino, California. Other examples of portable multifunction devices can include,

without limitation, laptop or tablet computers. Further, in some examples, user device 104 can be a non-portable multifunctional device. In particular, user device 104 can be a desktop computer, a game console, a television, or a television set-top box. In some examples, user device 104 can include a touch-sensitive surface (e.g., touch screen displays and/or touchpads). Further, user device 104 can optionally include one or more other physical user-interface devices, such as a physical keyboard, a mouse, and/or a joystick. Various examples of electronic devices, such as multifunctional devices, are described below in greater detail.

[0041] Examples of communication network(s) 110 can include local area networks (LAN) and wide area networks (WAN), e.g., the Internet. Communication network(s) 110 can be implemented using any known network protocol, including various wired or wireless protocols, such as, for example, Ethernet, Universal Serial Bus (USB), FIREWIRE, Global System for Mobile Communications (GSM), Enhanced Data GSM Environment (EDGE), code division multiple access (CDMA), time division multiple access (TDMA), Bluetooth, Wi-Fi, voice over Internet Protocol (VoIP), Wi-MAX, or any other suitable communication protocol.

[0042] Server system 108 can be implemented on one or more standalone data processing apparatus or a distributed network of computers. In some examples, server system 108 can also employ various virtual devices and/or services of third-party service providers (e.g., third-party cloud service providers) to provide the underlying computing resources and/or infrastructure resources of server system 108.

[0043] In some examples, user device 104 can communicate with DA server 106 via second user device 122. Second user device 122 can be similar or identical to user device 104. For example, second user device 122 can be similar to devices 200, 400, or 600 described below with reference to FIGs. 2A, 4, and 6A-B. User device 104 can be configured to communicatively couple to second user device 122 via a direct communication connection, such as Bluetooth, NFC, BTLE, or the like, or via a wired or wireless network, such as a local Wi-Fi network. In some examples, second user device 122 can be configured to act as a proxy between user device 104 and DA server 106. For example, DA client 102 of user device 104 can be configured to transmit information (e.g., a user request received at user device 104) to DA server 106 via second user device 122. DA server 106 can process the information and

return relevant data (e.g., data content responsive to the user request) to user device 104 via second user device 122.

[0044] In some examples, user device 104 can be configured to communicate abbreviated requests for data to second user device 122 to reduce the amount of information transmitted from user device 104. Second user device 122 can be configured to determine supplemental information to add to the abbreviated request to generate a complete request to transmit to DA server 106. This system architecture can advantageously allow user device 104 having limited communication capabilities and/or limited battery power (e.g., a watch or a similar compact electronic device) to access services provided by DA server 106 by using second user device 122, having greater communication capabilities and/or battery power (e.g., a mobile phone, laptop computer, tablet computer, or the like), as a proxy to DA server 106. While only two user devices 104 and 122 are shown in FIG. 1, it should be appreciated that system 100 can include any number and type of user devices configured in this proxy configuration to communicate with DA server system 106.

[0045] Although the digital assistant shown in FIG. 1 can include both a client-side portion (e.g., DA client 102) and a server-side portion (e.g., DA server 106), in some examples, the functions of a digital assistant can be implemented as a standalone application installed on a user device. In addition, the divisions of functionalities between the client and server portions of the digital assistant can vary in different implementations. For instance, in some examples, the DA client can be a thin-client that provides only user-facing input and output processing functions, and delegates all other functionalities of the digital assistant to a backend server.

2. Electronic Devices

[0046] Attention is now directed toward embodiments of electronic devices for implementing the client-side portion of a digital assistant. FIG. 2A is a block diagram illustrating portable multifunction device 200 with touch-sensitive display system 212 in accordance with some embodiments. Touch-sensitive display 212 is sometimes called a “touch screen” for convenience and is sometimes known as or called a “touch-sensitive display system.” Device 200 includes memory 202 (which optionally includes one or more computer-readable storage mediums), memory

controller 222, one or more processing units (CPUs) 220, peripherals interface 218, RF circuitry 208, audio circuitry 210, speaker 211, microphone 213, input/output (I/O) subsystem 206, other input control devices 216, and external port 224. Device 200 optionally includes one or more optical sensors 264. Device 200 optionally includes one or more contact intensity sensors 265 for detecting intensity of contacts on device 200 (e.g., a touch-sensitive surface such as touch-sensitive display system 212 of device 200). Device 200 optionally includes one or more tactile output generators 267 for generating tactile outputs on device 200 (e.g., generating tactile outputs on a touch-sensitive surface such as touch-sensitive display system 212 of device 200 or touchpad 455 of device 400). These components optionally communicate over one or more communication buses or signal lines 203.

[0047] As used in the specification and claims, the term “intensity” of a contact on a touch-sensitive surface refers to the force or pressure (force per unit area) of a contact (e.g., a finger contact) on the touch-sensitive surface, or to a substitute (proxy) for the force or pressure of a contact on the touch-sensitive surface. The intensity of a contact has a range of values that includes at least four distinct values and more typically includes hundreds of distinct values (e.g., at least 256). Intensity of a contact is, optionally, determined (or measured) using various approaches and various sensors or combinations of sensors. For example, one or more force sensors underneath or adjacent to the touch-sensitive surface are, optionally, used to measure force at various points on the touch-sensitive surface. In some implementations, force measurements from multiple force sensors are combined (e.g., a weighted average) to determine an estimated force of a contact. Similarly, a pressure-sensitive tip of a stylus is, optionally, used to determine a pressure of the stylus on the touch-sensitive surface. Alternatively, the size of the contact area detected on the touch-sensitive surface and/or changes thereto, the capacitance of the touch-sensitive surface proximate to the contact and/or changes thereto, and/or the resistance of the touch-sensitive surface proximate to the contact and/or changes thereto are, optionally, used as a substitute for the force or pressure of the contact on the touch-sensitive surface. In some implementations, the substitute measurements for contact force or pressure are used directly to determine whether an intensity threshold has been exceeded (e.g., the intensity threshold is described in units corresponding to the substitute measurements). In some implementations, the substitute measurements for contact

force or pressure are converted to an estimated force or pressure, and the estimated force or pressure is used to determine whether an intensity threshold has been exceeded (e.g., the intensity threshold is a pressure threshold measured in units of pressure). Using the intensity of a contact as an attribute of a user input allows for user access to additional device functionality that may otherwise not be accessible by the user on a reduced-size device with limited real estate for displaying affordances (e.g., on a touch-sensitive display) and/or receiving user input (e.g., via a touch-sensitive display, a touch-sensitive surface, or a physical/mechanical control such as a knob or a button).

[0048] As used in the specification and claims, the term “tactile output” refers to physical displacement of a device relative to a previous position of the device, physical displacement of a component (e.g., a touch-sensitive surface) of a device relative to another component (e.g., housing) of the device, or displacement of the component relative to a center of mass of the device that will be detected by a user with the user’s sense of touch. For example, in situations where the device or the component of the device is in contact with a surface of a user that is sensitive to touch (e.g., a finger, palm, or other part of a user’s hand), the tactile output generated by the physical displacement will be interpreted by the user as a tactile sensation corresponding to a perceived change in physical characteristics of the device or the component of the device. For example, movement of a touch-sensitive surface (e.g., a touch-sensitive display or trackpad) is, optionally, interpreted by the user as a “down click” or “up click” of a physical actuator button. In some cases, a user will feel a tactile sensation such as an “down click” or “up click” even when there is no movement of a physical actuator button associated with the touch-sensitive surface that is physically pressed (e.g., displaced) by the user’s movements. As another example, movement of the touch-sensitive surface is, optionally, interpreted or sensed by the user as “roughness” of the touch-sensitive surface, even when there is no change in smoothness of the touch-sensitive surface. While such interpretations of touch by a user will be subject to the individualized sensory perceptions of the user, there are many sensory perceptions of touch that are common to a large majority of users. Thus, when a tactile output is described as corresponding to a particular sensory perception of a user (e.g., an “up click,” a “down click,” “roughness”), unless otherwise stated, the generated tactile output corresponds to physical displacement of

the device or a component thereof that will generate the described sensory perception for a typical (or average) user.

[0049] It should be appreciated that device 200 is only one example of a portable multifunction device, and that device 200 optionally has more or fewer components than shown, optionally combines two or more components, or optionally has a different configuration or arrangement of the components. The various components shown in FIG. 2A are implemented in hardware, software, or a combination of both hardware and software, including one or more signal processing and/or application-specific integrated circuits.

[0050] Memory 202 may include one or more computer-readable storage mediums. The computer-readable storage mediums may be tangible and non-transitory. Memory 202 may include high-speed random access memory and may also include non-volatile memory, such as one or more magnetic disk storage devices, flash memory devices, or other non-volatile solid-state memory devices. Memory controller 222 may control access to memory 202 by other components of device 200.

[0051] In some examples, a non-transitory computer-readable storage medium of memory 202 can be used to store instructions (e.g., for performing aspects of process 800, described below) for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. In other examples, the instructions (e.g., for performing aspects of process 800, described below) can be stored on a non-transitory computer-readable storage medium (not shown) of the server system 108 or can be divided between the non-transitory computer-readable storage medium of memory 202 and the non-transitory computer-readable storage medium of server system 108. In the context of this document, a “non-transitory computer-readable storage medium” can be any medium that can contain or store the program for use by or in connection with the instruction execution system, apparatus, or device.

[0052] Peripherals interface 218 can be used to couple input and output peripherals of the device to CPU 220 and memory 202. The one or more processors

220 run or execute various software programs and/or sets of instructions stored in memory 202 to perform various functions for device 200 and to process data. In some embodiments, peripherals interface 218, CPU 220, and memory controller 222 may be implemented on a single chip, such as chip 204. In some other embodiments, they may be implemented on separate chips.

[0053] RF (radio frequency) circuitry 208 receives and sends RF signals, also called electromagnetic signals. RF circuitry 208 converts electrical signals to/from electromagnetic signals and communicates with communications networks and other communications devices via the electromagnetic signals. RF circuitry 208 optionally includes well-known circuitry for performing these functions, including but not limited to an antenna system, an RF transceiver, one or more amplifiers, a tuner, one or more oscillators, a digital signal processor, a CODEC chipset, a subscriber identity module (SIM) card, memory, and so forth. RF circuitry 208 optionally communicates with networks, such as the Internet, also referred to as the World Wide Web (WWW), an intranet and/or a wireless network, such as a cellular telephone network, a wireless local area network (LAN) and/or a metropolitan area network (MAN), and other devices by wireless communication. The RF circuitry 208 optionally includes well-known circuitry for detecting near field communication (NFC) fields, such as by a short-range communication radio. The wireless communication optionally uses any of a plurality of communications standards, protocols, and technologies, including but not limited to Global System for Mobile Communications (GSM), Enhanced Data GSM Environment (EDGE), high-speed downlink packet access (HSDPA), high-speed uplink packet access (HSUPA), Evolution, Data-Only (EV-DO), HSPA, HSPA+, Dual-Cell HSPA (DC-HSPDA), long term evolution (LTE), near field communication (NFC), wideband code division multiple access (W-CDMA), code division multiple access (CDMA), time division multiple access (TDMA), Bluetooth, Bluetooth Low Energy (BTLE), Wireless Fidelity (Wi-Fi) (e.g., IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, and/or IEEE 802.11ac), voice over Internet Protocol (VoIP), Wi-MAX, a protocol for e mail (e.g., Internet message access protocol (IMAP) and/or post office protocol (POP)), instant messaging (e.g., extensible messaging and presence protocol (XMPP), Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions (SIMPLE), Instant Messaging and Presence Service (IMPS)), and/or Short Message Service (SMS), or any other

suitable communication protocol, including communication protocols not yet developed as of the filing date of this document.

[0054] Audio circuitry 210, speaker 211, and microphone 213 provide an audio interface between a user and device 200. Audio circuitry 210 receives audio data from peripherals interface 218, converts the audio data to an electrical signal, and transmits the electrical signal to speaker 211. Speaker 211 converts the electrical signal to human-audible sound waves. Audio circuitry 210 also receives electrical signals converted by microphone 213 from sound waves. Audio circuitry 210 converts the electrical signal to audio data and transmits the audio data to peripherals interface 218 for processing. Audio data may be retrieved from and/or transmitted to memory 202 and/or RF circuitry 208 by peripherals interface 218. In some embodiments, audio circuitry 210 also includes a headset jack (e.g., 312, FIG. 3). The headset jack provides an interface between audio circuitry 210 and removable audio input/output peripherals, such as output-only headphones or a headset with both output (e.g., a headphone for one or both ears) and input (e.g., a microphone).

[0055] I/O subsystem 206 couples input/output peripherals on device 200, such as touch screen 212 and other input control devices 216, to peripherals interface 218. I/O subsystem 206 optionally includes display controller 256, optical sensor controller 258, intensity sensor controller 259, haptic feedback controller 261, and one or more input controllers 260 for other input or control devices. The one or more input controllers 260 receive/send electrical signals from/to other input control devices 216. The other input control devices 216 optionally include physical buttons (e.g., push buttons, rocker buttons, etc.), dials, slider switches, joysticks, click wheels, and so forth. In some alternate embodiments, input controller(s) 260 are, optionally, coupled to any (or none) of the following: a keyboard, an infrared port, a USB port, and a pointer device such as a mouse. The one or more buttons (e.g., 308, FIG. 3) optionally include an up/down button for volume control of speaker 211 and/or microphone 213. The one or more buttons optionally include a push button (e.g., 306, FIG. 3).

[0056] A quick press of the push button may disengage a lock of touch screen 212 or begin a process that uses gestures on the touch screen to unlock the device, as described in U.S. Patent Application 11/322,549, "Unlocking a Device by Performing

Gestures on an Unlock Image,” filed December 23, 2005, U.S. Pat. No. 7,657,849, which is hereby incorporated by reference in its entirety. A longer press of the push button (e.g., 306) may turn power to device 200 on or off. The user may be able to customize a functionality of one or more of the buttons. Touch screen 212 is used to implement virtual or soft buttons and one or more soft keyboards.

[0057] Touch-sensitive display 212 provides an input interface and an output interface between the device and a user. Display controller 256 receives and/or sends electrical signals from/to touch screen 212. Touch screen 212 displays visual output to the user. The visual output may include graphics, text, icons, video, and any combination thereof (collectively termed “graphics”). In some embodiments, some or all of the visual output may correspond to user-interface objects.

[0058] Touch screen 212 has a touch-sensitive surface, sensor, or set of sensors that accepts input from the user based on haptic and/or tactile contact. Touch screen 212 and display controller 256 (along with any associated modules and/or sets of instructions in memory 202) detect contact (and any movement or breaking of the contact) on touch screen 212 and convert the detected contact into interaction with user-interface objects (e.g., one or more soft keys, icons, web pages, or images) that are displayed on touch screen 212. In an exemplary embodiment, a point of contact between touch screen 212 and the user corresponds to a finger of the user.

[0059] Touch screen 212 may use LCD (liquid crystal display) technology, LPD (light emitting polymer display) technology, or LED (light emitting diode) technology, although other display technologies may be used in other embodiments. Touch screen 212 and display controller 256 may detect contact and any movement or breaking thereof using any of a plurality of touch sensing technologies now known or later developed, including but not limited to capacitive, resistive, infrared, and surface acoustic wave technologies, as well as other proximity sensor arrays or other elements for determining one or more points of contact with touch screen 212. In an exemplary embodiment, projected mutual capacitance sensing technology is used, such as that found in the iPhone® and iPod Touch® from Apple Inc. of Cupertino, California.

[0060] A touch-sensitive display in some embodiments of touch screen 212 may be analogous to the multi-touch sensitive touchpads described in the following U.S.

Patents: 6,323,846 (Westerman et al.), 6,570,557 (Westerman et al.), and/or 6,677,932 (Westerman), and/or U.S. Patent Publication 2002/0015024A1, each of which is hereby incorporated by reference in its entirety. However, touch screen 212 displays visual output from device 200, whereas touch-sensitive touchpads do not provide visual output.

[0061] A touch-sensitive display in some embodiments of touch screen 212 may be as described in the following applications: (1) U.S. Patent Application No. 11/381,313, "Multipoint Touch Surface Controller," filed May 2, 2006; (2) U.S. Patent Application No. 10/840,862, "Multipoint Touchscreen," filed May 6, 2004; (3) U.S. Patent Application No. 10/903,964, "Gestures For Touch Sensitive Input Devices," filed July 30, 2004; (4) U.S. Patent Application No. 11/048,264, "Gestures For Touch Sensitive Input Devices," filed January 31, 2005; (5) U.S. Patent Application No. 11/038,590, "Mode-Based Graphical User Interfaces For Touch Sensitive Input Devices," filed January 18, 2005; (6) U.S. Patent Application No. 11/228,758, "Virtual Input Device Placement On A Touch Screen User Interface," filed September 16, 2005; (7) U.S. Patent Application No. 11/228,700, "Operation Of A Computer With A Touch Screen Interface," filed September 16, 2005; (8) U.S. Patent Application No. 11/228,737, "Activating Virtual Keys Of A Touch-Screen Virtual Keyboard," filed September 16, 2005; and (9) U.S. Patent Application No. 11/367,749, "Multi-Functional Hand-Held Device," filed March 3, 2006. All of these applications are incorporated by reference herein in their entirety.

[0062] Touch screen 212 may have a video resolution in excess of 100 dpi. In some embodiments, the touch screen has a video resolution of approximately 160 dpi. The user may make contact with touch screen 212 using any suitable object or appendage, such as a stylus, a finger, and so forth. In some embodiments, the user interface is designed to work primarily with finger-based contacts and gestures, which can be less precise than stylus-based input due to the larger area of contact of a finger on the touch screen. In some embodiments, the device translates the rough finger-based input into a precise pointer/cursor position or command for performing the actions desired by the user.

[0063] In some embodiments, in addition to the touch screen, device 200 may include a touchpad (not shown) for activating or deactivating particular functions. In

some embodiments, the touchpad is a touch-sensitive area of the device that, unlike the touch screen, does not display visual output. The touchpad may be a touch-sensitive surface that is separate from touch screen 212 or an extension of the touch-sensitive surface formed by the touch screen.

[0064] Device 200 also includes power system 262 for powering the various components. Power system 262 may include a power management system, one or more power sources (e.g., battery, alternating current (AC)), a recharging system, a power failure detection circuit, a power converter or inverter, a power status indicator (e.g., a light-emitting diode (LED)) and any other components associated with the generation, management and distribution of power in portable devices.

[0065] Device 200 may also include one or more optical sensors 264. FIG. 2A shows an optical sensor coupled to optical sensor controller 258 in I/O subsystem 206. Optical sensor 264 may include charge-coupled device (CCD) or complementary metal-oxide semiconductor (CMOS) phototransistors. Optical sensor 264 receives light from the environment, projected through one or more lenses, and converts the light to data representing an image. In conjunction with imaging module 243 (also called a camera module), optical sensor 264 may capture still images or video. In some embodiments, an optical sensor is located on the back of device 200, opposite touch screen display 212 on the front of the device so that the touch screen display may be used as a viewfinder for still and/or video image acquisition. In some embodiments, an optical sensor is located on the front of the device so that the user's image may be obtained for video conferencing while the user views the other video conference participants on the touch screen display. In some embodiments, the position of optical sensor 264 can be changed by the user (e.g., by rotating the lens and the sensor in the device housing) so that a single optical sensor 264 may be used along with the touch screen display for both video conferencing and still and/or video image acquisition.

[0066] Device 200 optionally also includes one or more contact intensity sensors 265. FIG. 2A shows a contact intensity sensor coupled to intensity sensor controller 259 in I/O subsystem 206. Contact intensity sensor 265 optionally includes one or more piezoresistive strain gauges, capacitive force sensors, electric force sensors, piezoelectric force sensors, optical force sensors, capacitive touch-sensitive surfaces,

or other intensity sensors (e.g., sensors used to measure the force (or pressure) of a contact on a touch-sensitive surface). Contact intensity sensor 265 receives contact intensity information (e.g., pressure information or a proxy for pressure information) from the environment. In some embodiments, at least one contact intensity sensor is collocated with, or proximate to, a touch-sensitive surface (e.g., touch-sensitive display system 212). In some embodiments, at least one contact intensity sensor is located on the back of device 200, opposite touch screen display 212, which is located on the front of device 200.

[0067] Device 200 may also include one or more proximity sensors 266. FIG. 2A shows proximity sensor 266 coupled to peripherals interface 218. Alternately, proximity sensor 266 may be coupled to input controller 260 in I/O subsystem 206. Proximity sensor 266 may perform as described in U.S. Patent Application Nos. 11/241,839, “Proximity Detector In Handheld Device”; 11/240,788, “Proximity Detector In Handheld Device”; 11/620,702, “Using Ambient Light Sensor To Augment Proximity Sensor Output”; 11/586,862, “Automated Response To And Sensing Of User Activity In Portable Devices”; and 11/638,251, “Methods And Systems For Automatic Configuration Of Peripherals,” which are hereby incorporated by reference in their entirety. In some embodiments, the proximity sensor turns off and disables touch screen 212 when the multifunction device is placed near the user’s ear (e.g., when the user is making a phone call).

[0068] Device 200 optionally also includes one or more tactile output generators 267. FIG. 2A shows a tactile output generator coupled to haptic feedback controller 261 in I/O subsystem 206. Tactile output generator 267 optionally includes one or more electroacoustic devices such as speakers or other audio components and/or electromechanical devices that convert energy into linear motion such as a motor, solenoid, electroactive polymer, piezoelectric actuator, electrostatic actuator, or other tactile output generating component (e.g., a component that converts electrical signals into tactile outputs on the device). Contact intensity sensor 265 receives tactile feedback generation instructions from haptic feedback module 233 and generates tactile outputs on device 200 that are capable of being sensed by a user of device 200. In some embodiments, at least one tactile output generator is collocated with, or proximate to, a touch-sensitive surface (e.g., touch-sensitive display system 212) and,

optionally, generates a tactile output by moving the touch-sensitive surface vertically (e.g., in/out of a surface of device 200) or laterally (e.g., back and forth in the same plane as a surface of device 200). In some embodiments, at least one tactile output generator sensor is located on the back of device 200, opposite touch screen display 212, which is located on the front of device 200.

[0069] Device 200 may also include one or more accelerometers 268. FIG. 2A shows accelerometer 268 coupled to peripherals interface 218. Alternately, accelerometer 268 may be coupled to an input controller 260 in I/O subsystem 206. Accelerometer 268 may perform as described in U.S. Patent Publication No. 20050190059, “Acceleration-based Theft Detection System for Portable Electronic Devices,” and U.S. Patent Publication No. 20060017692, “Methods And Apparatuses For Operating A Portable Device Based On An Accelerometer,” both of which are incorporated by reference herein in their entirety. In some embodiments, information is displayed on the touch screen display in a portrait view or a landscape view based on an analysis of data received from the one or more accelerometers. Device 200 optionally includes, in addition to accelerometer(s) 268, a magnetometer (not shown) and a GPS (or GLONASS or other global navigation system) receiver (not shown) for obtaining information concerning the location and orientation (e.g., portrait or landscape) of device 200.

[0070] In some embodiments, the software components stored in memory 202 include operating system 226, communication module (or set of instructions) 228, contact/motion module (or set of instructions) 230, graphics module (or set of instructions) 232, text input module (or set of instructions) 234, Global Positioning System (GPS) module (or set of instructions) 235, Digital Assistant Client Module 229, and applications (or sets of instructions) 236. Further, memory 202 can store data and models, such as user data and models 231. Furthermore, in some embodiments, memory 202 (FIG. 2A) or 470 (FIG. 4) stores device/global internal state 257, as shown in FIGS. 2A and 4. Device/global internal state 257 includes one or more of: active application state, indicating which applications, if any, are currently active; display state, indicating what applications, views or other information occupy various regions of touch screen display 212; sensor state, including information

obtained from the device's various sensors and input control devices 216; and location information concerning the device's location and/or attitude.

[0071] Operating system 226 (e.g., Darwin, RTXC, LINUX, UNIX, OS X, iOS, WINDOWS, or an embedded operating system such as VxWorks) includes various software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communication between various hardware and software components.

[0072] Communication module 228 facilitates communication with other devices over one or more external ports 224 and also includes various software components for handling data received by RF circuitry 208 and/or external port 224. External port 224 (e.g., Universal Serial Bus (USB), FIREWIRE, etc.) is adapted for coupling directly to other devices or indirectly over a network (e.g., the Internet, wireless LAN, etc.). In some embodiments, the external port is a multi-pin (e.g., 30-pin) connector that is the same as, or similar to and/or compatible with, the 30-pin connector used on iPod® (trademark of Apple Inc.) devices.

[0073] Contact/motion module 230 optionally detects contact with touch screen 212 (in conjunction with display controller 256) and other touch-sensitive devices (e.g., a touchpad or physical click wheel). Contact/motion module 230 includes various software components for performing various operations related to detection of contact, such as determining if contact has occurred (e.g., detecting a finger-down event), determining an intensity of the contact (e.g., the force or pressure of the contact or a substitute for the force or pressure of the contact), determining if there is movement of the contact and tracking the movement across the touch-sensitive surface (e.g., detecting one or more finger-dragging events), and determining if the contact has ceased (e.g., detecting a finger-up event or a break in contact). Contact/motion module 230 receives contact data from the touch-sensitive surface. Determining movement of the point of contact, which is represented by a series of contact data, optionally includes determining speed (magnitude), velocity (magnitude and direction), and/or an acceleration (a change in magnitude and/or direction) of the point of contact. These operations are, optionally, applied to single contacts (e.g., one finger contacts) or to multiple simultaneous contacts (e.g., "multitouch"/multiple

finger contacts). In some embodiments, contact/motion module 230 and display controller 256 detect contact on a touchpad.

[0074] In some embodiments, contact/motion module 230 uses a set of one or more intensity thresholds to determine whether an operation has been performed by a user (e.g., to determine whether a user has “clicked” on an icon). In some embodiments, at least a subset of the intensity thresholds are determined in accordance with software parameters (e.g., the intensity thresholds are not determined by the activation thresholds of particular physical actuators and can be adjusted without changing the physical hardware of device 200). For example, a mouse “click” threshold of a trackpad or touch screen display can be set to any of a large range of predefined threshold values without changing the trackpad or touch screen display hardware. Additionally, in some implementations, a user of the device is provided with software settings for adjusting one or more of the set of intensity thresholds (e.g., by adjusting individual intensity thresholds and/or by adjusting a plurality of intensity thresholds at once with a system-level click “intensity” parameter).

[0075] Contact/motion module 230 optionally detects a gesture input by a user. Different gestures on the touch-sensitive surface have different contact patterns (e.g., different motions, timings, and/or intensities of detected contacts). Thus, a gesture is, optionally, detected by detecting a particular contact pattern. For example, detecting a finger tap gesture includes detecting a finger-down event followed by detecting a finger-up (liftoff) event at the same position (or substantially the same position) as the finger-down event (e.g., at the position of an icon). As another example, detecting a finger swipe gesture on the touch-sensitive surface includes detecting a finger-down event followed by detecting one or more finger-dragging events, and subsequently followed by detecting a finger-up (liftoff) event.

[0076] Graphics module 232 includes various known software components for rendering and displaying graphics on touch screen 212 or other display, including components for changing the visual impact (e.g., brightness, transparency, saturation, contrast, or other visual property) of graphics that are displayed. As used herein, the term “graphics” includes any object that can be displayed to a user, including ,without

limitation, text, web pages, icons (such as user-interface objects including soft keys), digital images, videos, animations, and the like.

[0077] In some embodiments, graphics module 232 stores data representing graphics to be used. Each graphic is, optionally, assigned a corresponding code. Graphics module 232 receives, from applications etc., one or more codes specifying graphics to be displayed along with, if necessary, coordinate data and other graphic property data, and then generates screen image data to output to display controller 256.

[0078] Haptic feedback module 233 includes various software components for generating instructions used by tactile output generator(s) 267 to produce tactile outputs at one or more locations on device 200 in response to user interactions with device 200.

[0079] Text input module 234, which may be a component of graphics module 232, provides soft keyboards for entering text in various applications (e.g., contacts 237, e mail 240, IM 241, browser 247, and any other application that needs text input).

[0080] GPS module 235 determines the location of the device and provides this information for use in various applications (e.g., to telephone 238 for use in location-based dialing; to camera 243 as picture/video metadata; and to applications that provide location-based services such as weather widgets, local yellow page widgets, and map/navigation widgets).

[0081] Digital assistant client module 229 can include various client-side digital assistant instructions to provide the client-side functionalities of the digital assistant. For example, digital assistant client module 229 can be capable of accepting voice input (e.g., speech input), text input, touch input, and/or gestural input through various user interfaces (e.g., microphone 213, accelerometer(s) 268, touch-sensitive display system 212, optical sensor(s) 229, other input control devices 216, etc.) of portable multifunction device 200. Digital assistant client module 229 can also be capable of providing output in audio (e.g., speech output), visual, and/or tactile forms through various output interfaces (e.g., speaker 211, touch-sensitive display system 212, tactile output generator(s) 267, etc.) of portable multifunction device 200. For

example, output can be provided as voice, sound, alerts, text messages, menus, graphics, videos, animations, vibrations, and/or combinations of two or more of the above. During operation, digital assistant client module 229 can communicate with DA server 106 using RF circuitry 208.

[0082] User data and models 231 can include various data associated with the user (e.g., user-specific vocabulary data, user preference data, user-specified name pronunciations, data from the user's electronic address book, to-do lists, shopping lists, etc.) to provide the client-side functionalities of the digital assistant. Further, user data and models 231 can includes various models (e.g., speech recognition models, statistical language models, natural language processing models, ontology, task flow models, service models, etc.) for processing user input and determining user intent.

[0083] In some examples, digital assistant client module 229 can utilize the various sensors, subsystems, and peripheral devices of portable multifunction device 200 to gather additional information from the surrounding environment of the portable multifunction device 200 to establish a context associated with a user, the current user interaction, and/or the current user input. In some examples, digital assistant client module 229 can provide the contextual information or a subset thereof with the user input to DA server 106 to help infer the user's intent. In some examples, the digital assistant can also use the contextual information to determine how to prepare and deliver outputs to the user. Contextual information can be referred to as context data.

[0084] In some examples, the contextual information that accompanies the user input can include sensor information, e.g., lighting, ambient noise, ambient temperature, images or videos of the surrounding environment, etc. In some examples, the contextual information can also include the physical state of the device, e.g., device orientation, device location, device temperature, power level, speed, acceleration, motion patterns, cellular signals strength, etc. In some examples, information related to the software state of DA server 106, e.g., running processes, installed programs, past and present network activities, background services, error logs, resources usage, etc., and of portable multifunction device 200 can be provided to DA server 106 as contextual information associated with a user input.

[0085] In some examples, the digital assistant client module 229 can selectively provide information (e.g., user data 231) stored on the portable multifunction device 200 in response to requests from DA server 106. In some examples, digital assistant client module 229 can also elicit additional input from the user via a natural language dialogue or other user interfaces upon request by DA server 106. Digital assistant client module 229 can pass the additional input to DA server 106 to help DA server 106 in intent deduction and/or fulfillment of the user's intent expressed in the user request.

[0086] A more detailed description of a digital assistant is described below with reference to FIGs. 7A-C. It should be recognized that digital assistant client module 229 can include any number of the sub-modules of digital assistant module 726 described below.

[0087] Applications 236 may include the following modules (or sets of instructions), or a subset or superset thereof:

- Contacts module 237 (sometimes called an address book or contact list);
- Telephone module 238;
- Video conference module 239;
- E-mail client module 240;
- Instant messaging (IM) module 241;
- Workout support module 242;
- Camera module 243 for still and/or video images;
- Image management module 244;
- Video player module;
- Music player module;
- Browser module 247;

- Calendar module 248;
- Widget modules 249, which may include one or more of: weather widget 249-1, stocks widget 249-2, calculator widget 249-3, alarm clock widget 249-4, dictionary widget 249-5, and other widgets obtained by the user, as well as user-created widgets 249-6;
- Widget creator module 250 for making user-created widgets 249-6;
- Search module 251;
- Video and music player module 252, which merges video player module and music player module;
- Notes module 253;
- Map module 254; and/or
- Online video module 255.

[0088] Examples of other applications 236 that may be stored in memory 202 include other word processing applications, other image editing applications, drawing applications, presentation applications, JAVA-enabled applications, encryption, digital rights management, voice recognition, and voice replication.

[0089] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, contacts module 237 may be used to manage an address book or contact list (e.g., stored in application internal state 292 of contacts module 237 in memory 202 or memory 470), including: adding name(s) to the address book; deleting name(s) from the address book; associating telephone number(s), e-mail address(es), physical address(es) or other information with a name; associating an image with a name; categorizing and sorting names; providing telephone numbers or e-mail addresses to initiate and/or facilitate communications by telephone 238, video conference module 239, e-mail 240, or IM 241; and so forth.

[0090] In conjunction with RF circuitry 208, audio circuitry 210, speaker 211, microphone 213, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, telephone module 238 may be used to enter a sequence of characters corresponding to a telephone number, access one or more telephone numbers in contacts module 237, modify a telephone number that has been entered, dial a respective telephone number, conduct a conversation, and disconnect or hang up when the conversation is completed. As noted above, the wireless communication may use any of a plurality of communications standards, protocols, and technologies.

[0091] In conjunction with RF circuitry 208, audio circuitry 210, speaker 211, microphone 213, touch screen 212, display controller 256, optical sensor 264, optical sensor controller 258, contact/motion module 230, graphics module 232, text input module 234, contacts module 237, and telephone module 238, video conference module 239 includes executable instructions to initiate, conduct, and terminate a video conference between a user and one or more other participants in accordance with user instructions.

[0092] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, e-mail client module 240 includes executable instructions to create, send, receive, and manage e-mail in response to user instructions. In conjunction with image management module 244, e-mail client module 240 makes it very easy to create and send e-mails with still or video images taken with camera module 243.

[0093] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, the instant messaging module 241 includes executable instructions to enter a sequence of characters corresponding to an instant message, to modify previously entered characters, to transmit a respective instant message (for example, using a Short Message Service (SMS) or Multimedia Message Service (MMS) protocol for telephony-based instant messages or using XMPP, SIMPLE, or IMPS for Internet-based instant messages), to receive instant messages, and to view received instant messages. In some embodiments, transmitted and/or received instant messages may include graphics, photos, audio files, video files and/or other attachments as are

supported in an MMS and/or an Enhanced Messaging Service (EMS). As used herein, “instant messaging” refers to both telephony-based messages (e.g., messages sent using SMS or MMS) and Internet-based messages (e.g., messages sent using XMPP, SIMPLE, or IMPS).

[0094] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, GPS module 235, map module 254, and music player module, workout support module 242 includes executable instructions to create workouts (e.g., with time, distance, and/or calorie burning goals); communicate with workout sensors (sports devices); receive workout sensor data; calibrate sensors used to monitor a workout; select and play music for a workout; and display, store, and transmit workout data.

[0095] In conjunction with touch screen 212, display controller 256, optical sensor(s) 264, optical sensor controller 258, contact/motion module 230, graphics module 232, and image management module 244, camera module 243 includes executable instructions to capture still images or video (including a video stream) and store them into memory 202, modify characteristics of a still image or video, or delete a still image or video from memory 202.

[0096] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, and camera module 243, image management module 244 includes executable instructions to arrange, modify (e.g., edit), or otherwise manipulate, label, delete, present (e.g., in a digital slide show or album), and store still and/or video images.

[0097] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, browser module 247 includes executable instructions to browse the Internet in accordance with user instructions, including searching, linking to, receiving, and displaying web pages or portions thereof, as well as attachments and other files linked to web pages.

[0098] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, e-mail client module 240, and browser module 247, calendar module 248 includes

executable instructions to create, display, modify, and store calendars and data associated with calendars (e.g., calendar entries, to-do lists, etc.) in accordance with user instructions.

[0099] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, and browser module 247, widget modules 249 are mini-applications that may be downloaded and used by a user (e.g., weather widget 249-1, stocks widget 249-2, calculator widget 249-3, alarm clock widget 249-4, and dictionary widget 249-5) or created by the user (e.g., user-created widget 249-6). In some embodiments, a widget includes an HTML (Hypertext Markup Language) file, a CSS (Cascading Style Sheets) file, and a JavaScript file. In some embodiments, a widget includes an XML (Extensible Markup Language) file and a JavaScript file (e.g., Yahoo! Widgets).

[0100] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, and browser module 247, the widget creator module 250 may be used by a user to create widgets (e.g., turning a user-specified portion of a web page into a widget).

[0101] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, search module 251 includes executable instructions to search for text, music, sound, image, video, and/or other files in memory 202 that match one or more search criteria (e.g., one or more user-specified search terms) in accordance with user instructions.

[0102] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, audio circuitry 210, speaker 211, RF circuitry 208, and browser module 247, video and music player module 252 includes executable instructions that allow the user to download and play back recorded music and other sound files stored in one or more file formats, such as MP3 or AAC files, and executable instructions to display, present, or otherwise play back videos (e.g., on touch screen 212 or on an external, connected display via external port 224). In some embodiments, device 200 optionally includes the functionality of an MP3 player, such as an iPod (trademark of Apple Inc.).

[0103] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, and text input module 234, notes module 253

includes executable instructions to create and manage notes, to-do lists, and the like in accordance with user instructions.

[0104] In conjunction with RF circuitry 208, touch screen 212, display controller 256, contact/motion module 230, graphics module 232, text input module 234, GPS module 235, and browser module 247, map module 254 may be used to receive, display, modify, and store maps and data associated with maps (e.g., driving directions, data on stores and other points of interest at or near a particular location, and other location-based data) in accordance with user instructions.

[0105] In conjunction with touch screen 212, display controller 256, contact/motion module 230, graphics module 232, audio circuitry 210, speaker 211, RF circuitry 208, text input module 234, e-mail client module 240, and browser module 247, online video module 255 includes instructions that allow the user to access, browse, receive (e.g., by streaming and/or download), play back (e.g., on the touch screen or on an external, connected display via external port 224), send an e-mail with a link to a particular online video, and otherwise manage online videos in one or more file formats, such as H.264. In some embodiments, instant messaging module 241, rather than e-mail client module 240, is used to send a link to a particular online video. Additional description of the online video application can be found in U.S. Provisional Patent Application No. 60/936,562, "Portable Multifunction Device, Method, and Graphical User Interface for Playing Online Videos," filed June 20, 2007, and U.S. Patent Application No. 11/968,067, "Portable Multifunction Device, Method, and Graphical User Interface for Playing Online Videos," filed December 31, 2007, the contents of which are hereby incorporated by reference in their entirety.

[0106] Each of the above-identified modules and applications corresponds to a set of executable instructions for performing one or more functions described above and the methods described in this application (e.g., the computer-implemented methods and other information processing methods described herein). These modules (e.g., sets of instructions) need not be implemented as separate software programs, procedures, or modules, and thus various subsets of these modules may be combined or otherwise rearranged in various embodiments. For example, video player module may be combined with music player module into a single module (e.g., video and music player module 252, FIG. 2A). In some embodiments, memory 202 may store a subset

of the modules and data structures identified above. Furthermore, memory 202 may store additional modules and data structures not described above.

[0107] In some embodiments, device 200 is a device where operation of a predefined set of functions on the device is performed exclusively through a touch screen and/or a touchpad. By using a touch screen and/or a touchpad as the primary input control device for operation of device 200, the number of physical input control devices (such as push buttons, dials, and the like) on device 200 may be reduced.

[0108] The predefined set of functions that are performed exclusively through a touch screen and/or a touchpad optionally include navigation between user interfaces. In some embodiments, the touchpad, when touched by the user, navigates device 200 to a main, home, or root menu from any user interface that is displayed on device 200. In such embodiments, a “menu button” is implemented using a touchpad. In some other embodiments, the menu button is a physical push button or other physical input control device instead of a touchpad.

[0109] FIG. 2B is a block diagram illustrating exemplary components for event handling in accordance with some embodiments. In some embodiments, memory 202 (FIG. 2A) or 470 (FIG. 4) includes event sorter 270 (e.g., in operating system 226) and a respective application 236-1 (e.g., any of the aforementioned applications 237-251, 255, 480-490).

[0110] Event sorter 270 receives event information and determines the application 236-1 and application view 291 of application 236-1 to which to deliver the event information. Event sorter 270 includes event monitor 271 and event dispatcher module 274. In some embodiments, application 236-1 includes application internal state 292, which indicates the current application view(s) displayed on touch-sensitive display 212 when the application is active or executing. In some embodiments, device/global internal state 257 is used by event sorter 270 to determine which application(s) is (are) currently active, and application internal state 292 is used by event sorter 270 to determine application views 291 to which to deliver event information.

[0111] In some embodiments, application internal state 292 includes additional information, such as one or more of: resume information to be used when application 236-1 resumes execution, user interface state information that indicates information

being displayed or that is ready for display by application 236-1, a state queue for enabling the user to go back to a prior state or view of application 236-1, and a redo/undo queue of previous actions taken by the user.

[0112] Event monitor 271 receives event information from peripherals interface 218. Event information includes information about a sub-event (e.g., a user touch on touch-sensitive display 212, as part of a multi-touch gesture). Peripherals interface 218 transmits information it receives from I/O subsystem 206 or a sensor, such as proximity sensor 266, accelerometer(s) 268, and/or microphone 213 (through audio circuitry 210). Information that peripherals interface 218 receives from I/O subsystem 206 includes information from touch-sensitive display 212 or a touch-sensitive surface.

[0113] In some embodiments, event monitor 271 sends requests to the peripherals interface 218 at predetermined intervals. In response, peripherals interface 218 transmits event information. In other embodiments, peripherals interface 218 transmits event information only when there is a significant event (e.g., receiving an input above a predetermined noise threshold and/or for more than a predetermined duration).

[0114] In some embodiments, event sorter 270 also includes a hit view determination module 272 and/or an active event recognizer determination module 273.

[0115] Hit view determination module 272 provides software procedures for determining where a sub-event has taken place within one or more views when touch-sensitive display 212 displays more than one view. Views are made up of controls and other elements that a user can see on the display.

[0116] Another aspect of the user interface associated with an application is a set of views, sometimes herein called application views or user interface windows, in which information is displayed and touch-based gestures occur. The application views (of a respective application) in which a touch is detected may correspond to programmatic levels within a programmatic or view hierarchy of the application. For example, the lowest level view in which a touch is detected may be called the hit view, and the set of events that are recognized as proper inputs may be determined based, at least in part, on the hit view of the initial touch that begins a touch-based gesture.

[0117] Hit view determination module 272 receives information related to sub events of a touch-based gesture. When an application has multiple views organized in a hierarchy, hit view determination module 272 identifies a hit view as the lowest view in the hierarchy which should handle the sub-event. In most circumstances, the hit view is the lowest level view in which an initiating sub-event occurs (e.g., the first sub-event in the sequence of sub-events that form an event or potential event). Once the hit view is identified by the hit view determination module 272, the hit view typically receives all sub-events related to the same touch or input source for which it was identified as the hit view.

[0118] Active event recognizer determination module 273 determines which view or views within a view hierarchy should receive a particular sequence of sub-events. In some embodiments, active event recognizer determination module 273 determines that only the hit view should receive a particular sequence of sub-events. In other embodiments, active event recognizer determination module 273 determines that all views that include the physical location of a sub-event are actively involved views, and therefore determines that all actively involved views should receive a particular sequence of sub-events. In other embodiments, even if touch sub-events were entirely confined to the area associated with one particular view, views higher in the hierarchy would still remain as actively involved views.

[0119] Event dispatcher module 274 dispatches the event information to an event recognizer (e.g., event recognizer 280). In embodiments including active event recognizer determination module 273, event dispatcher module 274 delivers the event information to an event recognizer determined by active event recognizer determination module 273. In some embodiments, event dispatcher module 274 stores in an event queue the event information, which is retrieved by a respective event receiver 282.

[0120] In some embodiments, operating system 226 includes event sorter 270. Alternatively, application 236-1 includes event sorter 270. In yet other embodiments, event sorter 270 is a stand-alone module, or a part of another module stored in memory 202, such as contact/motion module 230.

[0121] In some embodiments, application 236-1 includes a plurality of event handlers 290 and one or more application views 291, each of which includes instructions for

handling touch events that occur within a respective view of the application's user interface. Each application view 291 of the application 236-1 includes one or more event recognizers 280. Typically, a respective application view 291 includes a plurality of event recognizers 280. In other embodiments, one or more of event recognizers 280 are part of a separate module, such as a user interface kit (not shown) or a higher level object from which application 236-1 inherits methods and other properties. In some embodiments, a respective event handler 290 includes one or more of: data updater 276, object updater 277, GUI updater 278, and/or event data 279 received from event sorter 270. Event handler 290 may utilize or call data updater 276, object updater 277, or GUI updater 278 to update the application internal state 292. Alternatively, one or more of the application views 291 include one or more respective event handlers 290. Also, in some embodiments, one or more of data updater 276, object updater 277, and GUI updater 278 are included in a respective application view 291.

[0122] A respective event recognizer 280 receives event information (e.g., event data 279) from event sorter 270 and identifies an event from the event information. Event recognizer 280 includes event receiver 282 and event comparator 284. In some embodiments, event recognizer 280 also includes at least a subset of: metadata 283, and event delivery instructions 288 (which may include sub-event delivery instructions).

[0123] Event receiver 282 receives event information from event sorter 270. The event information includes information about a sub-event, for example, a touch or a touch movement. Depending on the sub-event, the event information also includes additional information, such as location of the sub-event. When the sub-event concerns motion of a touch, the event information may also include speed and direction of the sub-event. In some embodiments, events include rotation of the device from one orientation to another (e.g., from a portrait orientation to a landscape orientation, or vice versa), and the event information includes corresponding information about the current orientation (also called device attitude) of the device.

[0124] Event comparator 284 compares the event information to predefined event or sub-event definitions and, based on the comparison, determines an event or sub event, or determines or updates the state of an event or sub-event. In some embodiments, event comparator 284 includes event definitions 286. Event definitions 286 contain

definitions of events (e.g., predefined sequences of sub-events), for example, event 1 (287-1), event 2 (287-2), and others. In some embodiments, sub-events in an event (287) include, for example, touch begin, touch end, touch movement, touch cancellation, and multiple touching. In one example, the definition for event 1 (287-1) is a double tap on a displayed object. The double tap, for example, comprises a first touch (touch begin) on the displayed object for a predetermined phase, a first liftoff (touch end) for a predetermined phase, a second touch (touch begin) on the displayed object for a predetermined phase, and a second liftoff (touch end) for a predetermined phase. In another example, the definition for event 2 (287-2) is a dragging on a displayed object. The dragging, for example, comprises a touch (or contact) on the displayed object for a predetermined phase, a movement of the touch across touch-sensitive display 212, and liftoff of the touch (touch end). In some embodiments, the event also includes information for one or more associated event handlers 290.

[0125] In some embodiments, event definition 287 includes a definition of an event for a respective user-interface object. In some embodiments, event comparator 284 performs a hit test to determine which user-interface object is associated with a sub-event. For example, in an application view in which three user-interface objects are displayed on touch-sensitive display 212, when a touch is detected on touch-sensitive display 212, event comparator 284 performs a hit test to determine which of the three user-interface objects is associated with the touch (sub-event). If each displayed object is associated with a respective event handler 290, the event comparator uses the result of the hit test to determine which event handler 290 should be activated. For example, event comparator 284 selects an event handler associated with the sub-event and the object triggering the hit test.

[0126] In some embodiments, the definition for a respective event (287) also includes delayed actions that delay delivery of the event information until after it has been determined whether the sequence of sub-events does or does not correspond to the event recognizer's event type.

[0127] When a respective event recognizer 280 determines that the series of sub-events do not match any of the events in event definitions 286, the respective event recognizer 280 enters an event impossible, event failed, or event ended state, after which it disregards subsequent sub-events of the touch-based gesture. In this

situation, other event recognizers, if any, that remain active for the hit view continue to track and process sub-events of an ongoing touch-based gesture.

[0128] In some embodiments, a respective event recognizer 280 includes metadata 283 with configurable properties, flags, and/or lists that indicate how the event delivery system should perform sub-event delivery to actively involved event recognizers. In some embodiments, metadata 283 includes configurable properties, flags, and/or lists that indicate how event recognizers may interact, or are enabled to interact, with one another. In some embodiments, metadata 283 includes configurable properties, flags, and/or lists that indicate whether sub-events are delivered to varying levels in the view or programmatic hierarchy.

[0129] In some embodiments, a respective event recognizer 280 activates event handler 290 associated with an event when one or more particular sub-events of an event are recognized. In some embodiments, a respective event recognizer 280 delivers event information associated with the event to event handler 290. Activating an event handler 290 is distinct from sending (and deferred sending) sub-events to a respective hit view. In some embodiments, event recognizer 280 throws a flag associated with the recognized event, and event handler 290 associated with the flag catches the flag and performs a predefined process.

[0130] In some embodiments, event delivery instructions 288 include sub-event delivery instructions that deliver event information about a sub-event without activating an event handler. Instead, the sub-event delivery instructions deliver event information to event handlers associated with the series of sub-events or to actively involved views. Event handlers associated with the series of sub-events or with actively involved views receive the event information and perform a predetermined process.

[0131] In some embodiments, data updater 276 creates and updates data used in application 236-1. For example, data updater 276 updates the telephone number used in contacts module 237, or stores a video file used in video player module. In some embodiments, object updater 277 creates and updates objects used in application 236-1. For example, object updater 277 creates a new user-interface object or updates the position of a user-interface object. GUI updater 278 updates the GUI. For example,

GUI updater 278 prepares display information and sends it to graphics module 232 for display on a touch-sensitive display.

[0132] In some embodiments, event handler(s) 290 includes or has access to data updater 276, object updater 277, and GUI updater 278. In some embodiments, data updater 276, object updater 277, and GUI updater 278 are included in a single module of a respective application 236-1 or application view 291. In other embodiments, they are included in two or more software modules.

[0133] It shall be understood that the foregoing discussion regarding event handling of user touches on touch-sensitive displays also applies to other forms of user inputs to operate multifunction devices 200 with input devices, not all of which are initiated on touch screens. For example, mouse movement and mouse button presses, optionally coordinated with single or multiple keyboard presses or holds; contact movements such as taps, drags, scrolls, etc. on touchpads; pen stylus inputs; movement of the device; oral instructions; detected eye movements; biometric inputs; and/or any combination thereof are optionally utilized as inputs corresponding to sub-events which define an event to be recognized.

[0134] FIG. 3 illustrates a portable multifunction device 200 having a touch screen 212 in accordance with some embodiments. The touch screen optionally displays one or more graphics within user interface (UI) 300. In this embodiment, as well as others described below, a user is enabled to select one or more of the graphics by making a gesture on the graphics, for example, with one or more fingers 302 (not drawn to scale in the figure) or one or more styluses 303 (not drawn to scale in the figure). In some embodiments, selection of one or more graphics occurs when the user breaks contact with the one or more graphics. In some embodiments, the gesture optionally includes one or more taps, one or more swipes (from left to right, right to left, upward and/or downward), and/or a rolling of a finger (from right to left, left to right, upward and/or downward) that has made contact with device 200. In some implementations or circumstances, inadvertent contact with a graphic does not select the graphic. For example, a swipe gesture that sweeps over an application icon optionally does not select the corresponding application when the gesture corresponding to selection is a tap.

[0135] Device 200 may also include one or more physical buttons, such as “home” or menu button 304. As described previously, menu button 304 may be used to navigate to any application 236 in a set of applications that may be executed on device 200. Alternatively, in some embodiments, the menu button is implemented as a soft key in a GUI displayed on touch screen 212.

[0136] In one embodiment, device 200 includes touch screen 212, menu button 304, push button 306 for powering the device on/off and locking the device, volume adjustment button(s) 308, subscriber identity module (SIM) card slot 310, headset jack 312, and docking/charging external port 224. Push button 306 is, optionally, used to turn the power on/off on the device by depressing the button and holding the button in the depressed state for a predefined time interval; to lock the device by depressing the button and releasing the button before the predefined time interval has elapsed; and/or to unlock the device or initiate an unlock process. In an alternative embodiment, device 200 also accepts verbal input for activation or deactivation of some functions through microphone 213. Device 200 also, optionally, includes one or more contact intensity sensors 265 for detecting intensity of contacts on touch screen 212 and/or one or more tactile output generators 267 for generating tactile outputs for a user of device 200.

[0137] FIG. 4 is a block diagram of an exemplary multifunction device with a display and a touch-sensitive surface in accordance with some embodiments. Device 400 need not be portable. In some embodiments, device 400 is a laptop computer, a desktop computer, a tablet computer, a multimedia player device, a navigation device, an educational device (such as a child’s learning toy), a gaming system, or a control device (e.g., a home or industrial controller). Device 400 typically includes one or more processing units (CPUs) 410, one or more network or other communications interfaces 460, memory 470, and one or more communication buses 420 for interconnecting these components. Communication buses 420 optionally include circuitry (sometimes called a chipset) that interconnects and controls communications between system components. Device 400 includes input/output (I/O) interface 430 comprising display 440, which is typically a touch screen display. I/O interface 430 also optionally includes a keyboard and/or mouse (or other pointing device) 450 and touchpad 455, tactile output generator 457 for generating tactile outputs on device 400 (e.g., similar to tactile output generator(s) 267 described above with reference to FIG.

2A), sensors 459 (e.g., optical, acceleration, proximity, touch-sensitive, and/or contact intensity sensors similar to contact intensity sensor(s) 265 described above with reference to FIG. 2A). Memory 470 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM, or other random access solid state memory devices; and optionally includes non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid state storage devices. Memory 470 optionally includes one or more storage devices remotely located from CPU(s) 410. In some embodiments, memory 470 stores programs, modules, and data structures analogous to the programs, modules, and data structures stored in memory 202 of portable multifunction device 200 (FIG. 2A), or a subset thereof. Furthermore, memory 470 optionally stores additional programs, modules, and data structures not present in memory 202 of portable multifunction device 200. For example, memory 470 of device 400 optionally stores drawing module 480, presentation module 482, word processing module 484, website creation module 486, disk authoring module 488, and/or spreadsheet module 490, while memory 202 of portable multifunction device 200 (FIG. 2A) optionally does not store these modules.

[0138] Each of the above-identified elements in FIG. 4 may be stored in one or more of the previously mentioned memory devices. Each of the above-identified modules corresponds to a set of instructions for performing a function described above. The above-identified modules or programs (e.g., sets of instructions) need not be implemented as separate software programs, procedures, or modules, and thus various subsets of these modules may be combined or otherwise rearranged in various embodiments. In some embodiments, memory 470 may store a subset of the modules and data structures identified above. Furthermore, memory 470 may store additional modules and data structures not described above.

[0139] Attention is now directed towards embodiments of user interfaces that may be implemented on, for example, portable multifunction device 200.

[0140] FIG. 5A illustrates an exemplary user interface for a menu of applications on portable multifunction device 200 in accordance with some embodiments. Similar user interfaces may be implemented on device 400. In some embodiments, user interface 500 includes the following elements, or a subset or superset thereof:

- Signal strength indicator(s) 502 for wireless communication(s), such as cellular and Wi-Fi signals;
- Time 504;
- Bluetooth indicator 505;
- Battery status indicator 506;
- Tray 508 with icons for frequently used applications, such as:
 - Icon 516 for telephone module 238, labeled “Phone,” which optionally includes an indicator 514 of the number of missed calls or voicemail messages;
 - Icon 518 for e-mail client module 240, labeled “Mail,” which optionally includes an indicator 510 of the number of unread e-mails;
 - Icon 520 for browser module 247, labeled “Browser;” and
 - Icon 522 for video and music player module 252, also referred to as iPod (trademark of Apple Inc.) module 252, labeled “iPod;” and
- Icons for other applications, such as:
 - Icon 524 for IM module 241, labeled “Messages;”
 - Icon 526 for calendar module 248, labeled “Calendar;”
 - Icon 528 for image management module 244, labeled “Photos;”
 - Icon 530 for camera module 243, labeled “Camera;”
 - Icon 532 for online video module 255, labeled “Online Video;”
 - Icon 534 for stocks widget 249-2, labeled “Stocks;”
 - Icon 536 for map module 254, labeled “Maps;”
 - Icon 538 for weather widget 249-1, labeled “Weather;”

- Icon 540 for alarm clock widget 249-4, labeled “Clock;”
- Icon 542 for workout support module 242, labeled “Workout Support;”
- Icon 544 for notes module 253, labeled “Notes;” and
- Icon 546 for a settings application or module, labeled “Settings,” which provides access to settings for device 200 and its various applications 236.

[0141] It should be noted that the icon labels illustrated in FIG. 5A are merely exemplary. For example, icon 522 for video and music player module 252 may optionally be labeled “Music” or “Music Player.” Other labels are, optionally, used for various application icons. In some embodiments, a label for a respective application icon includes a name of an application corresponding to the respective application icon. In some embodiments, a label for a particular application icon is distinct from a name of an application corresponding to the particular application icon.

[0142] FIG. 5B illustrates an exemplary user interface on a device (e.g., device 400, FIG. 4) with a touch-sensitive surface 551 (e.g., a tablet or touchpad 455, FIG. 4) that is separate from the display 550 (e.g., touch screen display 212). Device 400 also, optionally, includes one or more contact intensity sensors (e.g., one or more of sensors 457) for detecting intensity of contacts on touch-sensitive surface 551 and/or one or more tactile output generators 459 for generating tactile outputs for a user of device 400.

[0143] Although some of the examples which follow will be given with reference to inputs on touch screen display 212 (where the touch-sensitive surface and the display are combined), in some embodiments, the device detects inputs on a touch-sensitive surface that is separate from the display, as shown in FIG. 5B. In some embodiments, the touch-sensitive surface (e.g., 551 in FIG. 5B) has a primary axis (e.g., 552 in FIG. 5B) that corresponds to a primary axis (e.g., 553 in FIG. 5B) on the display (e.g., 550). In accordance with these embodiments, the device detects contacts (e.g., 560 and 562 in FIG. 5B) with the touch-sensitive surface 551 at locations that correspond to respective locations on the display (e.g., in FIG. 5B, 560 corresponds to 568 and 562 corresponds to 570). In this way, user inputs (e.g., contacts 560 and 562, and

movements thereof) detected by the device on the touch-sensitive surface (e.g., 551 in FIG. 5B) are used by the device to manipulate the user interface on the display (e.g., 550 in FIG. 5B) of the multifunction device when the touch-sensitive surface is separate from the display. It should be understood that similar methods are, optionally, used for other user interfaces described herein.

[0144] Additionally, while the following examples are given primarily with reference to finger inputs (e.g., finger contacts, finger tap gestures, finger swipe gestures), it should be understood that, in some embodiments, one or more of the finger inputs are replaced with input from another input device (e.g., a mouse-based input or stylus input). For example, a swipe gesture is, optionally, replaced with a mouse click (e.g., instead of a contact) followed by movement of the cursor along the path of the swipe (e.g., instead of movement of the contact). As another example, a tap gesture is, optionally, replaced with a mouse click while the cursor is located over the location of the tap gesture (e.g., instead of detection of the contact followed by ceasing to detect the contact). Similarly, when multiple user inputs are simultaneously detected, it should be understood that multiple computer mice are, optionally, used simultaneously, or a mouse and finger contacts are, optionally, used simultaneously.

[0145] FIG. 6A illustrates exemplary personal electronic device 600. Device 600 includes body 602. In some embodiments, device 600 can include some or all of the features described with respect to devices 200 and 400 (e.g., FIGS. 2A-4B). In some embodiments, device 600 has touch-sensitive display screen 604, hereafter touch screen 604. Alternatively, or in addition to touch screen 604, device 600 has a display and a touch-sensitive surface. As with devices 200 and 400, in some embodiments, touch screen 604 (or the touch-sensitive surface) may have one or more intensity sensors for detecting intensity of contacts (e.g., touches) being applied. The one or more intensity sensors of touch screen 604 (or the touch-sensitive surface) can provide output data that represents the intensity of touches. The user interface of device 600 can respond to touches based on their intensity, meaning that touches of different intensities can invoke different user interface operations on device 600.

[0146] Techniques for detecting and processing touch intensity may be found, for example, in related applications: International Patent Application Serial No. PCT/US2013/040061, titled "Device, Method, and Graphical User Interface for Displaying User Interface Objects Corresponding to an Application," filed May 8,

2013, and International Patent Application Serial No. PCT/US2013/069483, titled “Device, Method, and Graphical User Interface for Transitioning Between Touch Input to Display Output Relationships,” filed November 11, 2013, each of which is hereby incorporated by reference in their entirety.

[0147] In some embodiments, device 600 has one or more input mechanisms 606 and 608. Input mechanisms 606 and 608, if included, can be physical. Examples of physical input mechanisms include push buttons and rotatable mechanisms. In some embodiments, device 600 has one or more attachment mechanisms. Such attachment mechanisms, if included, can permit attachment of device 600 with, for example, hats, eyewear, earrings, necklaces, shirts, jackets, bracelets, watch straps, chains, trousers, belts, shoes, purses, backpacks, and so forth. These attachment mechanisms may permit device 600 to be worn by a user.

[0148] FIG. 6B depicts exemplary personal electronic device 600. In some embodiments, device 600 can include some or all of the components described with respect to FIGS. 2A, 2B, and 4. Device 600 has bus 612 that operatively couples I/O section 614 with one or more computer processors 616 and memory 618. I/O section 614 can be connected to display 604, which can have touch-sensitive component 622 and, optionally, touch-intensity sensitive component 624. In addition, I/O section 614 can be connected with communication unit 630 for receiving application and operating system data, using Wi-Fi, Bluetooth, near field communication (NFC), cellular, and/or other wireless communication techniques. Device 600 can include input mechanisms 606 and/or 608. Input mechanism 606 may be a rotatable input device or a depressible and rotatable input device, for example. Input mechanism 608 may be a button, in some examples.

[0149] Input mechanism 608 may be a microphone, in some examples. Personal electronic device 600 can include various sensors, such as GPS sensor 632, accelerometer 634, directional sensor 640 (e.g., compass), gyroscope 636, motion sensor 638, and/or a combination thereof, all of which can be operatively connected to I/O section 614.

[0150] Memory 618 of personal electronic device 600 can be a non-transitory computer-readable storage medium, for storing computer-executable instructions, which, when executed by one or more computer processors 616, for example, can

cause the computer processors to perform the techniques described below, including process 800 (FIG. 8). The computer-executable instructions can also be stored and/or transported within any non-transitory computer-readable storage medium for use by or in connection with an instruction execution system, apparatus, or device, such as a computer-based system, processor-containing system, or other system that can fetch the instructions from the instruction execution system, apparatus, or device and execute the instructions. For purposes of this document, a “non-transitory computer-readable storage medium” can be any medium that can tangibly contain or store computer-executable instructions for use by or in connection with the instruction execution system, apparatus, or device. The non-transitory computer-readable storage medium can include, but is not limited to, magnetic, optical, and/or semiconductor storages. Examples of such storage include magnetic disks, optical discs based on CD, DVD, or Blu-ray technologies, as well as persistent solid-state memory such as flash, solid-state drives, and the like. Personal electronic device 600 is not limited to the components and configuration of FIG. 6B, but can include other or additional components in multiple configurations.

[0151] As used here, the term “affordance” refers to a user-interactive graphical user interface object that may be displayed on the display screen of devices 200, 400, and/or 600 (FIGS. 2, 4, and 6). For example, an image (e.g., icon), a button, and text (e.g., hyperlink) may each constitute an affordance.

[0152] As used herein, the term “focus selector” refers to an input element that indicates a current part of a user interface with which a user is interacting. In some implementations that include a cursor or other location marker, the cursor acts as a “focus selector” so that when an input (e.g., a press input) is detected on a touch-sensitive surface (e.g., touchpad 455 in FIG. 4 or touch-sensitive surface 551 in FIG. 5B) while the cursor is over a particular user interface element (e.g., a button, window, slider or other user interface element), the particular user interface element is adjusted in accordance with the detected input. In some implementations that include a touch screen display (e.g., touch-sensitive display system 212 in FIG. 2A or touch screen 212 in FIG. 5A) that enables direct interaction with user interface elements on the touch screen display, a detected contact on the touch screen acts as a “focus selector” so that when an input (e.g., a press input by the contact) is detected on the touch screen display at a location of a particular user interface element (e.g., a button,

window, slider, or other user interface element), the particular user interface element is adjusted in accordance with the detected input. In some implementations, focus is moved from one region of a user interface to another region of the user interface without corresponding movement of a cursor or movement of a contact on a touch screen display (e.g., by using a tab key or arrow keys to move focus from one button to another button); in these implementations, the focus selector moves in accordance with movement of focus between different regions of the user interface. Without regard to the specific form taken by the focus selector, the focus selector is generally the user interface element (or contact on a touch screen display) that is controlled by the user so as to communicate the user's intended interaction with the user interface (e.g., by indicating, to the device, the element of the user interface with which the user is intending to interact). For example, the location of a focus selector (e.g., a cursor, a contact, or a selection box) over a respective button while a press input is detected on the touch-sensitive surface (e.g., a touchpad or touch screen) will indicate that the user is intending to activate the respective button (as opposed to other user interface elements shown on a display of the device).

[0153] As used in the specification and claims, the term “characteristic intensity” of a contact refers to a characteristic of the contact based on one or more intensities of the contact. In some embodiments, the characteristic intensity is based on multiple intensity samples. The characteristic intensity is, optionally, based on a predefined number of intensity samples, or a set of intensity samples collected during a predetermined time period (e.g., 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 seconds) relative to a predefined event (e.g., after detecting the contact, prior to detecting liftoff of the contact, before or after detecting a start of movement of the contact, prior to detecting an end of the contact, before or after detecting an increase in intensity of the contact, and/or before or after detecting a decrease in intensity of the contact). A characteristic intensity of a contact is, optionally based on one or more of: a maximum value of the intensities of the contact, a mean value of the intensities of the contact, an average value of the intensities of the contact, a top 10 percentile value of the intensities of the contact, a value at the half maximum of the intensities of the contact, a value at the 90 percent maximum of the intensities of the contact, or the like. In some embodiments, the duration of the contact is used in determining the characteristic intensity (e.g., when the characteristic intensity is an average of the

intensity of the contact over time). In some embodiments, the characteristic intensity is compared to a set of one or more intensity thresholds to determine whether an operation has been performed by a user. For example, the set of one or more intensity thresholds may include a first intensity threshold and a second intensity threshold. In this example, a contact with a characteristic intensity that does not exceed the first threshold results in a first operation, a contact with a characteristic intensity that exceeds the first intensity threshold and does not exceed the second intensity threshold results in a second operation, and a contact with a characteristic intensity that exceeds the second threshold results in a third operation. In some embodiments, a comparison between the characteristic intensity and one or more thresholds is used to determine whether or not to perform one or more operations (e.g., whether to perform a respective operation or forgo performing the respective operation) rather than being used to determine whether to perform a first operation or a second operation.

[0154] In some embodiments, a portion of a gesture is identified for purposes of determining a characteristic intensity. For example, a touch-sensitive surface may receive a continuous swipe contact transitioning from a start location and reaching an end location, at which point the intensity of the contact increases. In this example, the characteristic intensity of the contact at the end location may be based on only a portion of the continuous swipe contact, and not the entire swipe contact (e.g., only the portion of the swipe contact at the end location). In some embodiments, a smoothing algorithm may be applied to the intensities of the swipe contact prior to determining the characteristic intensity of the contact. For example, the smoothing algorithm optionally includes one or more of: an unweighted sliding-average smoothing algorithm, a triangular smoothing algorithm, a median filter smoothing algorithm, and/or an exponential smoothing algorithm. In some circumstances, these smoothing algorithms eliminate narrow spikes or dips in the intensities of the swipe contact for purposes of determining a characteristic intensity.

[0155] The intensity of a contact on the touch-sensitive surface may be characterized relative to one or more intensity thresholds, such as a contact-detection intensity threshold, a light press intensity threshold, a deep press intensity threshold, and/or one or more other intensity thresholds. In some embodiments, the light press intensity threshold corresponds to an intensity at which the device will perform operations

typically associated with clicking a button of a physical mouse or a trackpad. In some embodiments, the deep press intensity threshold corresponds to an intensity at which the device will perform operations that are different from operations typically associated with clicking a button of a physical mouse or a trackpad. In some embodiments, when a contact is detected with a characteristic intensity below the light press intensity threshold (e.g., and above a nominal contact-detection intensity threshold below which the contact is no longer detected), the device will move a focus selector in accordance with movement of the contact on the touch-sensitive surface without performing an operation associated with the light press intensity threshold or the deep press intensity threshold. Generally, unless otherwise stated, these intensity thresholds are consistent between different sets of user interface figures.

[0156] An increase of characteristic intensity of the contact from an intensity below the light press intensity threshold to an intensity between the light press intensity threshold and the deep press intensity threshold is sometimes referred to as a “light press” input. An increase of characteristic intensity of the contact from an intensity below the deep press intensity threshold to an intensity above the deep press intensity threshold is sometimes referred to as a “deep press” input. An increase of characteristic intensity of the contact from an intensity below the contact-detection intensity threshold to an intensity between the contact-detection intensity threshold and the light press intensity threshold is sometimes referred to as detecting the contact on the touch-surface. A decrease of characteristic intensity of the contact from an intensity above the contact-detection intensity threshold to an intensity below the contact-detection intensity threshold is sometimes referred to as detecting liftoff of the contact from the touch-surface. In some embodiments, the contact-detection intensity threshold is zero. In some embodiments, the contact-detection intensity threshold is greater than zero.

[0157] In some embodiments described herein, one or more operations are performed in response to detecting a gesture that includes a respective press input or in response to detecting the respective press input performed with a respective contact (or a plurality of contacts), where the respective press input is detected based at least in part on detecting an increase in intensity of the contact (or plurality of contacts) above a press-input intensity threshold. In some embodiments, the respective operation is performed in response to detecting the increase in intensity of the respective contact

above the press-input intensity threshold (e.g., a “down stroke” of the respective press input). In some embodiments, the press input includes an increase in intensity of the respective contact above the press-input intensity threshold and a subsequent decrease in intensity of the contact below the press-input intensity threshold, and the respective operation is performed in response to detecting the subsequent decrease in intensity of the respective contact below the press-input threshold (e.g., an “up stroke” of the respective press input).

[0158] In some embodiments, the device employs intensity hysteresis to avoid accidental inputs sometimes termed “jitter,” where the device defines or selects a hysteresis intensity threshold with a predefined relationship to the press-input intensity threshold (e.g., the hysteresis intensity threshold is X intensity units lower than the press-input intensity threshold or the hysteresis intensity threshold is 75%, 90%, or some reasonable proportion of the press-input intensity threshold). Thus, in some embodiments, the press input includes an increase in intensity of the respective contact above the press-input intensity threshold and a subsequent decrease in intensity of the contact below the hysteresis intensity threshold that corresponds to the press-input intensity threshold, and the respective operation is performed in response to detecting the subsequent decrease in intensity of the respective contact below the hysteresis intensity threshold (e.g., an “up stroke” of the respective press input). Similarly, in some embodiments, the press input is detected only when the device detects an increase in intensity of the contact from an intensity at or below the hysteresis intensity threshold to an intensity at or above the press-input intensity threshold and, optionally, a subsequent decrease in intensity of the contact to an intensity at or below the hysteresis intensity, and the respective operation is performed in response to detecting the press input (e.g., the increase in intensity of the contact or the decrease in intensity of the contact, depending on the circumstances).

[0159] For ease of explanation, the descriptions of operations performed in response to a press input associated with a press-input intensity threshold or in response to a gesture including the press input are, optionally, triggered in response to detecting either: an increase in intensity of a contact above the press-input intensity threshold, an increase in intensity of a contact from an intensity below the hysteresis intensity threshold to an intensity above the press-input intensity threshold, a decrease in intensity of the contact below the press-input intensity threshold, and/or a decrease in

intensity of the contact below the hysteresis intensity threshold corresponding to the press-input intensity threshold. Additionally, in examples where an operation is described as being performed in response to detecting a decrease in intensity of a contact below the press-input intensity threshold, the operation is, optionally, performed in response to detecting a decrease in intensity of the contact below a hysteresis intensity threshold corresponding to, and lower than, the press-input intensity threshold.

3. Digital Assistant System

[0160] FIG. 7A illustrates a block diagram of digital assistant system 700 in accordance with various examples. In some examples, digital assistant system 700 can be implemented on a standalone computer system. In some examples, digital assistant system 700 can be distributed across multiple computers. In some examples, some of the modules and functions of the digital assistant can be divided into a server portion and a client portion, where the client portion resides on one or more user devices (e.g., devices 104, 122, 200, 400, or 600) and communicates with the server portion (e.g., server system 108) through one or more networks, e.g., as shown in FIG. 1. In some examples, digital assistant system 700 can be an implementation of server system 108 (and/or DA server 106) shown in FIG. 1. It should be noted that digital assistant system 700 is only one example of a digital assistant system, and that digital assistant system 700 can have more or fewer components than shown, may combine two or more components, or may have a different configuration or arrangement of the components. The various components shown in FIG. 7A can be implemented in hardware, software instructions for execution by one or more processors, firmware, including one or more signal processing and/or application specific integrated circuits, or a combination thereof.

[0161] Digital assistant system 700 can include memory 702, one or more processors 704, input/output (I/O) interface 706, and network communications interface 708. These components can communicate with one another over one or more communication buses or signal lines 710.

[0162] In some examples, memory 702 can include a non-transitory computer-readable medium, such as high-speed random access memory and/or a non-volatile

computer-readable storage medium (e.g., one or more magnetic disk storage devices, flash memory devices, or other non-volatile solid-state memory devices).

[0163] In some examples, I/O interface 706 can couple input/output devices 716 of digital assistant system 700, such as displays, keyboards, touch screens, and microphones, to user interface module 722. I/O interface 706, in conjunction with user interface module 722, can receive user inputs (e.g., voice input, keyboard inputs, touch inputs, etc.) and processes them accordingly. In some examples, e.g., when the digital assistant is implemented on a standalone user device, digital assistant system 700 can include any of the components and I/O communication interfaces described with respect to devices 200, 400, or 600 in FIGs. 2A, 4, 6A-B, respectively. In some examples, digital assistant system 700 can represent the server portion of a digital assistant implementation, and can interact with the user through a client-side portion residing on a user device (e.g., devices 104, 200, 400, or 600).

[0164] In some examples, the network communications interface 708 can include wired communication port(s) 712 and/or wireless transmission and reception circuitry 714. The wired communication port(s) can receive and send communication signals via one or more wired interfaces, e.g., Ethernet, Universal Serial Bus (USB), FIREWIRE, etc. The wireless circuitry 714 can receive and send RF signals and/or optical signals from/to communications networks and other communications devices. The wireless communications can use any of a plurality of communications standards, protocols, and technologies, such as GSM, EDGE, CDMA, TDMA, Bluetooth, Wi-Fi, VoIP, Wi-MAX, or any other suitable communication protocol. Network communications interface 708 can enable communication between digital assistant system 700 with networks, such as the Internet, an intranet, and/or a wireless network, such as a cellular telephone network, a wireless local area network (LAN), and/or a metropolitan area network (MAN), and other devices.

[0165] In some examples, memory 702, or the computer-readable storage media of memory 702, can store programs, modules, instructions, and data structures including all or a subset of: operating system 718, communications module 720, user interface module 722, one or more applications 724, and digital assistant module 726. In particular, memory 702, or the computer-readable storage media of memory 702, can store instructions for performing process 800, described below. One or more

processors 704 can execute these programs, modules, and instructions, and reads/writes from/to the data structures.

[0166] Operating system 718 (e.g., Darwin, RTXC, LINUX, UNIX, iOS, OS X, WINDOWS, or an embedded operating system such as VxWorks) can include various software components and/or drivers for controlling and managing general system tasks (e.g., memory management, storage device control, power management, etc.) and facilitates communications between various hardware, firmware, and software components.

[0167] Communications module 720 can facilitate communications between digital assistant system 700 with other devices over network communications interface 708. For example, communications module 720 can communicate with RF circuitry 208 of electronic devices such as devices 200, 400, and 600 shown in FIG. 2A, 4, 6A-B, respectively. Communications module 720 can also include various components for handling data received by wireless circuitry 714 and/or wired communications port 712.

[0168] User interface module 722 can receive commands and/or inputs from a user via I/O interface 706 (e.g., from a keyboard, touch screen, pointing device, controller, and/or microphone), and generate user interface objects on a display. User interface module 722 can also prepare and deliver outputs (e.g., speech, sound, animation, text, icons, vibrations, haptic feedback, light, etc.) to the user via the I/O interface 706 (e.g., through displays, audio channels, speakers, touch-pads, etc.).

[0169] Applications 724 can include programs and/or modules that are configured to be executed by one or more processors 704. For example, if the digital assistant system is implemented on a standalone user device, applications 724 can include user applications, such as games, a calendar application, a navigation application, or an email application. If digital assistant system 700 is implemented on a server, applications 724 can include resource management applications, diagnostic applications, or scheduling applications, for example.

[0170] Memory 702 can also store digital assistant module 726 (or the server portion of a digital assistant). In some examples, digital assistant module 726 can include the following sub-modules, or a subset or superset thereof: input/output processing module 728, speech-to-text (STT) processing module 730, natural language

processing module 732, dialogue flow processing module 734, task flow processing module 736, service processing module 738, and speech synthesis module 740. Each of these modules can have access to one or more of the following systems or data and models of the digital assistant module 726, or a subset or superset thereof: ontology 760, vocabulary index 744, user data 748, task flow models 754, service models 756, and ASR systems.

[0171] In some examples, using the processing modules, data, and models implemented in digital assistant module 726, the digital assistant can perform at least some of the following: converting speech input into text; identifying a user's intent expressed in a natural language input received from the user; actively eliciting and obtaining information needed to fully infer the user's intent (e.g., by disambiguating words, phrases, intentions, etc.); determining the task flow for fulfilling the inferred intent; and executing the task flow to fulfill the inferred intent.

[0172] In some examples, as shown in FIG. 7B, I/O processing module 728 can interact with the user through I/O devices 716 in FIG. 7A or with a user device (e.g., devices 104, 200, 400, or 600) through network communications interface 708 in FIG. 7A to obtain user input (e.g., a speech input) and to provide responses (e.g., as speech outputs) to the user input. I/O processing module 728 can optionally obtain contextual information associated with the user input from the user device, along with or shortly after the receipt of the user input. The contextual information can include user-specific data, vocabulary, and/or preferences relevant to the user input. In some examples, the contextual information also includes software and hardware states of the user device at the time the user request is received, and/or information related to the surrounding environment of the user at the time that the user request was received. In some examples, I/O processing module 728 can also send follow-up questions to, and receive answers from, the user regarding the user request. When a user request is received by I/O processing module 728 and the user request can include speech input, I/O processing module 728 can forward the speech input to STT processing module 730 (or speech recognizer) for speech-to-text conversions.

[0173] STT processing module 730 can include one or more ASR systems. The one or more ASR systems can process the speech input that is received through I/O processing module 728 to produce a recognition result. Each ASR system can include a front-end speech pre-processor. The front-end speech pre-processor can extract

representative features from the speech input. For example, the front-end speech pre-processor can perform a Fourier transform on the speech input to extract spectral features that characterize the speech input as a sequence of representative multi-dimensional vectors. Further, each ASR system can include one or more speech recognition models (e.g., acoustic models and/or language models) and can implement one or more speech recognition engines. Examples of speech recognition models can include Hidden Markov Models, Gaussian-Mixture Models, Deep Neural Network Models, n-gram language models, and other statistical models. Examples of speech recognition engines can include the dynamic time warping based engines and weighted finite-state transducers (WFST) based engines. The one or more speech recognition models and the one or more speech recognition engines can be used to process the extracted representative features of the front-end speech pre-processor to produce intermediate recognitions results (e.g., phonemes, phonemic strings, and sub-words), and ultimately, text recognition results (e.g., words, word strings, or sequence of tokens). In some examples, the speech input can be processed at least partially by a third-party service or on the user's device (e.g., device 104, 200, 400, or 600) to produce the recognition result. Once STT processing module 730 produces recognition results containing a text string (e.g., words, or sequence of words, or sequence of tokens), the recognition result can be passed to natural language processing module 732 for intent deduction.

[0174] More details on the speech-to-text processing are described in U.S. Utility Application Serial No. 13/236,942 for "Consolidating Speech Recognition Results," filed on September 20, 2011, the entire disclosure of which is incorporated herein by reference.

[0175] In some examples, STT processing module 730 can include and/or access a vocabulary of recognizable words via phonetic alphabet conversion module 731. Each vocabulary word can be associated with one or more candidate pronunciations of the word represented in a speech recognition phonetic alphabet. In particular, the vocabulary of recognizable words can include a word that is associated with a plurality of candidate pronunciations. For example, the vocabulary may include the word "tomato" that is associated with the candidate pronunciations of /tə'meɪroʊ/ and /tə'matou/. Further, vocabulary words can be associated with custom candidate pronunciations that are based on previous speech inputs from the user. Such custom

candidate pronunciations can be stored in STT processing module 730 and can be associated with a particular user via the user's profile on the device. In some examples, the candidate pronunciations for words can be determined based on the spelling of the word and one or more linguistic and/or phonetic rules. In some examples, the candidate pronunciations can be manually generated, e.g., based on known canonical pronunciations.

[0176] In some examples, the candidate pronunciations can be ranked based on the commonness of the candidate pronunciation. For example, the candidate pronunciation /tə'meɪrou/ can be ranked higher than /tə'matoʊ/, because the former is a more commonly used pronunciation (e.g., among all users, for users in a particular geographical region, or for any other appropriate subset of users). In some examples, candidate pronunciations can be ranked based on whether the candidate pronunciation is a custom candidate pronunciation associated with the user. For example, custom candidate pronunciations can be ranked higher than canonical candidate pronunciations. This can be useful for recognizing proper nouns having a unique pronunciation that deviates from canonical pronunciation. In some examples, candidate pronunciations can be associated with one or more speech characteristics, such as geographic origin, nationality, or ethnicity. For example, the candidate pronunciation /tə'meɪrou/ can be associated with the United States, whereas the candidate pronunciation /tə'matoʊ/ can be associated with Great Britain. Further, the rank of the candidate pronunciation can be based on one or more characteristics (e.g., geographic origin, nationality, ethnicity, etc.) of the user stored in the user's profile on the device. For example, it can be determined from the user's profile that the user is associated with the United States. Based on the user being associated with the United States, the candidate pronunciation /tə'meɪrou/ (associated with the United States) can be ranked higher than the candidate pronunciation /tə'matoʊ/ (associated with Great Britain). In some examples, one of the ranked candidate pronunciations can be selected as a predicted pronunciation (e.g., the most likely pronunciation).

[0177] When a speech input is received, STT processing module 730 can be used to determine the phonemes corresponding to the speech input (e.g., using an acoustic model), and then attempt to determine words that match the phonemes (e.g., using a language model). For example, if STT processing module 730 can first identify the sequence of phonemes /tə'meɪrou/ corresponding to a portion of the speech input, it

can then determine, based on vocabulary index 744, that this sequence corresponds to the word “tomato.”

[0178] In some examples, STT processing module 730 can use approximate matching techniques to determine words in an utterance. Thus, for example, the STT processing module 730 can determine that the sequence of phonemes /tə'meɪrou/ corresponds to the word “tomato,” even if that particular sequence of phonemes is not one of the candidate sequence of phonemes for that word.

[0179] Natural language processing module 732 (“natural language processor”) of the digital assistant can take the sequence of words or tokens (“token sequence”) generated by STT processing module 730, and attempt to associate the token sequence with one or more “actionable intents” recognized by the digital assistant. An “actionable intent” can represent a task that can be performed by the digital assistant, and can have an associated task flow implemented in task flow models 754. The associated task flow can be a series of programmed actions and steps that the digital assistant takes in order to perform the task. The scope of a digital assistant’s capabilities can be dependent on the number and variety of task flows that have been implemented and stored in task flow models 754, or in other words, on the number and variety of “actionable intents” that the digital assistant recognizes. The effectiveness of the digital assistant, however, can also be dependent on the assistant’s ability to infer the correct “actionable intent(s)” from the user request expressed in natural language.

[0180] In some examples, in addition to the sequence of words or tokens obtained from STT processing module 730, natural language processing module 732 can also receive contextual information associated with the user request, e.g., from I/O processing module 728. The natural language processing module 732 can optionally use the contextual information to clarify, supplement, and/or further define the information contained in the token sequence received from STT processing module 730. The contextual information can include, for example, user preferences, hardware, and/or software states of the user device, sensor information collected before, during, or shortly after the user request, prior interactions (e.g., dialogue) between the digital assistant and the user, and the like. As described herein, contextual information can be dynamic, and can change with time, location, content of the dialogue, and other factors.

[0181] In some examples, the natural language processing can be based on, e.g., ontology 760. Ontology 760 can be a hierarchical structure containing many nodes, each node representing either an “actionable intent” or a “property” relevant to one or more of the “actionable intents” or other “properties.” As noted above, an “actionable intent” can represent a task that the digital assistant is capable of performing, i.e., it is “actionable” or can be acted on. A “property” can represent a parameter associated with an actionable intent or a sub-aspect of another property. A linkage between an actionable intent node and a property node in ontology 760 can define how a parameter represented by the property node pertains to the task represented by the actionable intent node.

[0182] In some examples, ontology 760 can be made up of actionable intent nodes and property nodes. Within ontology 760, each actionable intent node can be linked to one or more property nodes either directly or through one or more intermediate property nodes. Similarly, each property node can be linked to one or more actionable intent nodes either directly or through one or more intermediate property nodes. For example, as shown in FIG. 7C, ontology 760 can include a “restaurant reservation” node (i.e., an actionable intent node). Property nodes “restaurant,” “date/time” (for the reservation), and “party size” can each be directly linked to the actionable intent node (i.e., the “restaurant reservation” node).

[0183] In addition, property nodes “cuisine,” “price range,” “phone number,” and “location” can be sub-nodes of the property node “restaurant,” and can each be linked to the “restaurant reservation” node (i.e., the actionable intent node) through the intermediate property node “restaurant.” For another example, as shown in FIG. 7C, ontology 760 can also include a “set reminder” node (i.e., another actionable intent node). Property nodes “date/time” (for setting the reminder) and “subject” (for the reminder) can each be linked to the “set reminder” node. Since the property “date/time” can be relevant to both the task of making a restaurant reservation and the task of setting a reminder, the property node “date/time” can be linked to both the “restaurant reservation” node and the “set reminder” node in ontology 760.

[0184] An actionable intent node, along with its linked concept nodes, can be described as a “domain.” In the present discussion, each domain can be associated with a respective actionable intent, and refers to the group of nodes (and the relationships there between) associated with the particular actionable intent. For

example, ontology 760 shown in FIG. 7C can include an example of restaurant reservation domain 762 and an example of reminder domain 764 within ontology 760. The restaurant reservation domain includes the actionable intent node “restaurant reservation,” property nodes “restaurant,” “date/time,” and “party size,” and sub-property nodes “cuisine,” “price range,” “phone number,” and “location.” Reminder domain 764 can include the actionable intent node “set reminder,” and property nodes “subject” and “date/time.” In some examples, ontology 760 can be made up of many domains. Each domain can share one or more property nodes with one or more other domains. For example, the “date/time” property node can be associated with many different domains (e.g., a scheduling domain, a travel reservation domain, a movie ticket domain, etc.), in addition to restaurant reservation domain 762 and reminder domain 764.

[0185] While FIG. 7C illustrates two example domains within ontology 760, other domains can include, for example, “find a movie,” “initiate a phone call,” “find directions,” “schedule a meeting,” “send a message,” and “provide an answer to a question,” “read a list,” “providing navigation instructions,” “provide instructions for a task” and so on. A “send a message” domain can be associated with a “send a message” actionable intent node, and may further include property nodes such as “recipient(s),” “message type,” and “message body.” The property node “recipient” can be further defined, for example, by the sub-property nodes such as “recipient name” and “message address.”

[0186] In some examples, ontology 760 can include all the domains (and hence actionable intents) that the digital assistant is capable of understanding and acting upon. In some examples, ontology 760 can be modified, such as by adding or removing entire domains or nodes, or by modifying relationships between the nodes within the ontology 760.

[0187] In some examples, nodes associated with multiple related actionable intents can be clustered under a “super domain” in ontology 760. For example, a “travel” super-domain can include a cluster of property nodes and actionable intent nodes related to travel. The actionable intent nodes related to travel can include “airline reservation,” “hotel reservation,” “car rental,” “get directions,” “find points of interest,” and so on. The actionable intent nodes under the same super domain (e.g., the “travel” super domain) can have many property nodes in common. For example,

the actionable intent nodes for “airline reservation,” “hotel reservation,” “car rental,” “get directions,” and “find points of interest” can share one or more of the property nodes “start location,” “destination,” “departure date/time,” “arrival date/time,” and “party size.”

[0188] In some examples, each node in ontology 760 can be associated with a set of words and/or phrases that are relevant to the property or actionable intent represented by the node. The respective set of words and/or phrases associated with each node can be the so-called “vocabulary” associated with the node. The respective set of words and/or phrases associated with each node can be stored in vocabulary index 744 in association with the property or actionable intent represented by the node. For example, returning to FIG. 7B, the vocabulary associated with the node for the property of “restaurant” can include words such as “food,” “drinks,” “cuisine,” “hungry,” “eat,” “pizza,” “fast food,” “meal,” and so on. For another example, the vocabulary associated with the node for the actionable intent of “initiate a phone call” can include words and phrases such as “call,” “phone,” “dial,” “ring,” “call this number,” “make a call to,” and so on. The vocabulary index 744 can optionally include words and phrases in different languages.

[0189] Natural language processing module 732 can receive the token sequence (e.g., a text string) from STT processing module 730, and determine what nodes are implicated by the words in the token sequence. In some examples, if a word or phrase in the token sequence is found to be associated with one or more nodes in ontology 760 (via vocabulary index 744), the word or phrase can “trigger” or “activate” those nodes. Based on the quantity and/or relative importance of the activated nodes, natural language processing module 732 can select one of the actionable intents as the task that the user intended the digital assistant to perform. In some examples, the domain that has the most “triggered” nodes can be selected. In some examples, the domain having the highest confidence value (e.g., based on the relative importance of its various triggered nodes) can be selected. In some examples, the domain can be selected based on a combination of the number and the importance of the triggered nodes. In some examples, additional factors are considered in selecting the node as well, such as whether the digital assistant has previously correctly interpreted a similar request from a user.

[0190] User data 748 can include user-specific information, such as user-specific vocabulary, user preferences, user address, user's default and secondary languages, user's contact list, and other short-term or long-term information for each user. In some examples, natural language processing module 732 can use the user-specific information to supplement the information contained in the user input to further define the user intent. For example, for a user request "invite my friends to my birthday party," natural language processing module 732 can be able to access user data 748 to determine who the "friends" are and when and where the "birthday party" would be held, rather than requiring the user to provide such information explicitly in his/her request.

[0191] Other details of searching an ontology based on a token string is described in U.S. Utility Application Serial No. 12/341,743 for "Method and Apparatus for Searching Using An Active Ontology," filed December 22, 2008, the entire disclosure of which is incorporated herein by reference.

[0192] In some examples, once natural language processing module 732 identifies an actionable intent (or domain) based on the user request, natural language processing module 732 can generate a structured query to represent the identified actionable intent. In some examples, the structured query can include parameters for one or more nodes within the domain for the actionable intent, and at least some of the parameters are populated with the specific information and requirements specified in the user request. For example, the user may say "Make me a dinner reservation at a sushi place at 7." In this case, natural language processing module 732 can be able to correctly identify the actionable intent to be "restaurant reservation" based on the user input. According to the ontology, a structured query for a "restaurant reservation" domain may include parameters such as {Cuisine}, {Time}, {Date}, {Party Size}, and the like. In some examples, based on the speech input and the text derived from the speech input using STT processing module 730, natural language processing module 732 can generate a partial structured query for the restaurant reservation domain, where the partial structured query includes the parameters {Cuisine = "Sushi"} and {Time = "7pm"}. However, in this example, the user's utterance contains insufficient information to complete the structured query associated with the domain. Therefore, other necessary parameters such as {Party Size} and {Date} may not be specified in the structured query based on the information currently available.

In some examples, natural language processing module 732 can populate some parameters of the structured query with received contextual information. For example, in some examples, if the user requested a sushi restaurant “near me,” natural language processing module 732 can populate a {location} parameter in the structured query with GPS coordinates from the user device.

[0193] In some examples, natural language processing module 732 can pass the generated structured query (including any completed parameters) to task flow processing module 736 (“task flow processor”). Task flow processing module 736 can be configured to receive the structured query from natural language processing module 732, complete the structured query, if necessary, and perform the actions required to “complete” the user’s ultimate request. In some examples, the various procedures necessary to complete these tasks can be provided in task flow models 754. In some examples, task flow models 754 can include procedures for obtaining additional information from the user and task flows for performing actions associated with the actionable intent.

[0194] As described above, in order to complete a structured query, task flow processing module 736 may need to initiate additional dialogue with the user in order to obtain additional information, and/or disambiguate potentially ambiguous utterances. When such interactions are necessary, task flow processing module 736 can invoke dialogue flow processing module 734 to engage in a dialogue with the user. In some examples, dialogue flow processing module 734 can determine how (and/or when) to ask the user for the additional information and receives and processes the user responses. The questions can be provided to and answers can be received from the users through I/O processing module 728. In some examples, dialogue flow processing module 734 can present dialogue output to the user via audio and/or visual output, and receives input from the user via spoken or physical (e.g., clicking) responses. Continuing with the example above, when task flow processing module 736 invokes dialogue flow processing module 734 to determine the “party size” and “date” information for the structured query associated with the domain “restaurant reservation,” dialogue flow processing module 734 can generate questions such as “For how many people?” and “On which day?” to pass to the user. Once answers are received from the user, dialogue flow processing module 734 can then populate the structured query with the missing information, or pass the

information to task flow processing module 736 to complete the missing information from the structured query.

[0195] Once task flow processing module 736 has completed the structured query for an actionable intent, task flow processing module 736 can proceed to perform the ultimate task associated with the actionable intent. Accordingly, task flow processing module 736 can execute the steps and instructions in the task flow model according to the specific parameters contained in the structured query. For example, the task flow model for the actionable intent of “restaurant reservation” can include steps and instructions for contacting a restaurant and actually requesting a reservation for a particular party size at a particular time. For example, using a structured query such as: {restaurant reservation, restaurant = ABC Café, date = 3/12/2012, time = 7pm, party size = 5}, task flow processing module 736 can perform the steps of: (1) logging onto a server of the ABC Café or a restaurant reservation system such as OPENTABLE®, (2) entering the date, time, and party size information in a form on the website, (3) submitting the form, and (4) making a calendar entry for the reservation in the user’s calendar.

[0196] In some examples, task flow processing module 736 can employ the assistance of service processing module 738 (“service processing module”) to complete a task requested in the user input or to provide an informational answer requested in the user input. For example, service processing module 738 can act on behalf of task flow processing module 736 to make a phone call, set a calendar entry, invoke a map search, invoke or interact with other user applications installed on the user device, and invoke or interact with third-party services (e.g., a restaurant reservation portal, a social networking website, a banking portal, etc.). In some examples, the protocols and application programming interfaces (API) required by each service can be specified by a respective service model among service models 756. Service processing module 738 can access the appropriate service model for a service and generate requests for the service in accordance with the protocols and APIs required by the service according to the service model.

[0197] For example, if a restaurant has enabled an online reservation service, the restaurant can submit a service model specifying the necessary parameters for making a reservation and the APIs for communicating the values of the necessary parameter to the online reservation service. When requested by task flow processing module

736, service processing module 738 can establish a network connection with the online reservation service using the web address stored in the service model, and send the necessary parameters of the reservation (e.g., time, date, party size) to the online reservation interface in a format according to the API of the online reservation service.

[0198] In some examples, natural language processing module 732, dialogue flow processing module 734, and task flow processing module 736 can be used collectively and iteratively to infer and define the user's intent, obtain information to further clarify and refine the user intent, and finally generate a response (i.e., an output to the user, or the completion of a task) to fulfill the user's intent. The generated response can be a dialogue response to the speech input that at least partially fulfills the user's intent. Further, in some examples, the generated response can be output as a speech output. In these examples, the generated response can be sent to speech synthesis module 740 (e.g., speech synthesizer) where it can be processed to synthesize the dialogue response in speech form. In yet other examples, the generated response can be data content relevant to satisfying a user request in the speech input.

[0199] Speech synthesis module 740 can be configured to synthesize speech outputs for presentation to the user. Speech synthesis module 740 synthesizes speech outputs based on text provided by the digital assistant. For example, the generated dialogue response can be in the form of a text string. Speech synthesis module 740 can convert the text string to an audible speech output. Speech synthesis module 740 can use any appropriate speech synthesis technique in order to generate speech outputs from text, including, but not limited, to concatenative synthesis, unit selection synthesis, diphone synthesis, domain-specific synthesis, formant synthesis, articulatory synthesis, hidden Markov model (HMM) based synthesis, and sinewave synthesis. In some examples, speech synthesis module 740 can be configured to synthesize individual words based on phonemic strings corresponding to the words. For example, a phonemic string can be associated with a word in the generated dialogue response. The phonemic string can be stored in metadata associated with the word. Speech synthesis model 740 can be configured to directly process the phonemic string in the metadata to synthesize the word in speech form.

[0200] In some examples, instead of (or in addition to) using speech synthesis module 740, speech synthesis can be performed on a remote device (e.g., the server system

108), and the synthesized speech can be sent to the user device for output to the user. For example, this can occur in some implementations where outputs for a digital assistant are generated at a server system. And because server systems generally have more processing power or resources than a user device, it can be possible to obtain higher quality speech outputs than would be practical with client-side synthesis.

[0201] Additional details on digital assistants can be found in the U.S. Utility Application No. 12/987,982, entitled “Intelligent Automated Assistant,” filed January 10, 2011, and U.S. Utility Application No. 13/251,088, entitled “Generating and Processing Task Items That Represent Tasks to Perform,” filed September 30, 2011, the entire disclosures of which are incorporated herein by reference.

[0202] FIG. 8 illustrates exemplary process 800 for handling multiple actionable commands in a single user utterance according to various examples. Process 800 can, for example, be executed on processing modules 114 of server system 108 discussed above with reference to FIG. 1. In other examples, process 800 can be executed on processor 704 of digital assistant system 700 discussed above with reference to FIG. 7. In still other examples, processing modules 114 of server system 108 and processor 704 of digital assistant system 700 can be used together to execute some or all of process 800. At block 802, speech input can be received from a user (e.g., from microphone 213 of Fig. 2). In some examples, the speech input can be directed to a virtual assistant, and can include one actionable command (e.g., “What’s the weather going to be today?”) or multiple actionable commands (e.g., “Navigate to Jessica’s house and send her a message that I’m on my way.”). An actionable command as used herein can include any task, process, query, action, request, or the like that a virtual assistant can perform, respond to, or otherwise handle. For example, an actionable command can include a query about a stock price, a request to send a message, a command to provide navigation services, a command to initiate a phone call, or the like.

[0203] In some examples, a user can control the capture of a multi-part command by signaling with a button, touchscreen interface, or the like. For example, to cause a user’s device to continue listening for additional commands, a user can push and hold a button (e.g., of user device 104) while speaking, and can release the button after finishing as many commands as the user desires to speak. In other examples, a user device can continue listening while speech continues, or can include an always-

listening function that monitors audio continuously (e.g., at all times or for some extended duration).

[0204] A multi-part command within a single utterance can include any number of commands with any number of arguments. For example, a user can request multiple actions associated with the same subject (e.g., email a picture to a friend, save the picture to memory, and set the picture as the wallpaper on a device display). In another example, a user can request multiple actions associated with different subjects (e.g., email a picture to a friend, send a message to a relative saying “I’ll be there soon,” dismiss a calendar notification, and remind the user of a particular task in an hour). Some speech input can also mix commands with dictation, as in the example of dictating a message to be sent while requesting other actions in the same utterance. Speech input with a single utterance can thus include any number of commands associated with any number of arguments.

[0205] At block 804, a text string can be generated based on the speech input using a speech transcription process. Any of a variety of speech transcription approaches can be used. In addition, in some examples, multiple possible transcriptions can be generated and processed in sequence or simultaneously to identify the best possible match (e.g., the most likely match).

[0206] At block 806, the text string (or multiple candidate text strings) can be parsed into at least a first candidate substring and a second candidate substring. In one example, any speech input can be parsed into any number of candidate substrings to test for multi-part commands. In other examples, parsing into multiple candidate substrings can be done based on the length of the speech input, a user indication (e.g., holding a button down while speaking multiple commands), identification of multiple imperative verbs, or the like.

[0207] FIG. 9 illustrates an exemplary parsed multi-part voice command. User speech 920 can include the transcription of a single utterance saying, “Navigate to Jessica’s house and send her a message that I’m on my way.” In one example, user speech 920 can be parsed into two substrings: first candidate substring 922 and second candidate substring 924. Such parsing can be done in a variety of ways. For example, domain keywords can be identified in the text string, and the string can be parsed based on their location. In the example of FIG. 9, the word “navigate” can

correspond to a virtual assistant domain for providing maps, turn-by-turn navigation instructions, or other navigation assistance to a user. The word “send” can correspond to a messaging domain or multiple virtual assistant domains (e.g., email, instant messages, text messages, messaging applications, or the like). The word “message” can likewise correspond to multiple virtual assistant domains. In some instances, the combination of “send” and “message” within a certain number of words of one another can indicate a likely matching virtual assistant domain.

[0208] Based on the positions of the identified domain keywords, user speech 920 can be split into first candidate substring 922 beginning with the keyword “Navigate” and ending prior to the conjunction “and,” and second candidate substring 924 beginning with the keyword “send” and ending with the end of the string. In other examples, the conjunction “and” can be included within either candidate substring or both candidate substrings. Various other domain keywords can be used in a similar manner to parse a string. For example, a weather domain might be associated with keywords or key phrases like “weather,” “temperature,” “how cold,” “how hot,” “rain,” etc. Similarly, a phone domain might be associated with keywords “call,” “dial,” etc. A calendar domain might be associated with keywords or key phrases like “meeting,” “set up a meeting,” “meet with,” “new appointment,” “schedule,” etc. A reminder domain might be associated with keywords or key phrases like “remind,” “reminder,” “set a reminder,” “remind me,” etc. It should be understood that various other domains can have a variety of associated keywords or key phrases that can be used to parse a text string.

[0209] Instead of or in combination with domain keywords, imperative verbs can be identified in the text string, and the string can be parsed based on their location. In the example of FIG. 9, the word “Navigate” is the first imperative verb in the string. The word “send” is the next imperative verb in the string. In some instances, the word “message” can be interpreted as another imperative verb. In this example, however, a variety of factors can cause “message” to correctly be recognized as a noun: it is preceded with “a,” it follows a few words behind “send,” it is followed by “that,” etc. Two imperative verbs can thus be identified in user speech 920. The positions of the imperative verbs can then be used to parse the string into first candidate substring 922 beginning with the imperative verb “Navigate” and second candidate substring 924 beginning with the imperative verb “send.” Other imperative

verb examples include words like “schedule,” “set up,” “call,” “email,” “text,” “post,” “play,” “launch,” “remind,” “note,” “turn on,” “search,” etc. In addition, in some examples, a user utterance can be broken into the various parts of speech to aid in correctly identifying imperative verbs (e.g., as opposed to homonyms that might be nouns).

[0210] Instead of or in combination with domain keywords and/or imperative verbs, a single user utterance can be parsed in multiple ways, and the multiple parses can be tested to determine the best parse. In other examples, a string can be parsed based on a predetermined substring length (e.g., a number of characters, a number of words, etc.). In still other examples, a string can be parsed in all possible ways (e.g., ranging from each individual word as a substring to all words together in a single string) or nearly all possible ways (e.g., ranging from a minimum of each pair or triple of words as a substring to all words together in a single string). Given multiple ways of parsing the string, parse results can be analyzed to dismiss various parse approaches based on a variety of factors. For example, if a parse results in a candidate substring without a verb, that parse can be dismissed. In some examples, some or all of the various parse results can be analyzed as described below with reference to block 808 of process 800 to identify the parse with the highest likelihood of accurately reflecting a user’s intentions. A text string from a single utterance of user speech can thus be parsed in a variety of ways into at least a first candidate substring and a second candidate substring.

[0211] Referring again to process 800 of FIG. 8, at block 808, a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command can be determined. In some examples, each candidate substring can be analyzed to determine a probability that it corresponds to a valid, actionable command. As noted above, this can be done, in some examples, to verify the accuracy of a particular parse and/or to compare the likelihoods of different parses resulting in different candidate substrings. In some examples, the probabilities can be used to select the parse and its associated substrings that may be most likely to accurately reflect the user’s intention (e.g., accurately split up a single utterance into distinct actionable commands). The probabilities for the various candidate substrings can be determined in a variety of ways, and multiple approaches can be combined to

arrive at an integrated probability (e.g., using linear interpolation or other combination mechanisms).

[0212] In one example, each candidate substring (from one parse or from multiple different potential parses) can be analyzed for semantic coherence. In some examples, semantic coherence can be determined for each candidate substring based on only the words within the substring (e.g., without considering context or previous or subsequent words). Semantic coherence can include a binary yes/no result or a probability. Semantic coherence can reflect whether a substring can stand alone as a coherent command (or request), having meaning in the target language (e.g., English). For example, as noted above, a substring without a verb could be identified as lacking semantic coherence or as having a low probability of being semantically coherent (e.g., “to Jessica’s house,” “progress report meeting,” etc.). In another example, a substring lacking a subject, argument, entity, or the like could be identified as lacking semantic coherence or as having a low probability of being semantically coherent (e.g., “Navigate to,” “Tell John that,” etc.). In yet another example, a substring with an incomplete prepositional phrase or preposition lacking a noun could be identified as lacking semantic coherence or as having a low probability of being semantically coherent (e.g., “Set a reminder to buy milk at,” “Schedule a meeting for,” etc.). In addition, in some examples, a candidate substring can be analyzed according to the parts of speech to verify adherence to grammar rules, and semantic coherence can be determined accordingly. It should be understood that semantic coherence can be determined for a substring in a variety of other ways, and different rules and tests can be applied for different languages, dialects, regions, or the like.

[0213] Instead of or in combination with semantic coherence, each candidate substring can be analyzed in view of user request templates of a virtual assistant. For example, a virtual assistant can process user requests in part by matching a spoken request to a template. The template can have associated processes, tasks, algorithms, or the like that a virtual assistant can use to handle a user’s request. In addition, a template can have designated variables where entities, arguments, or the like can be expected (e.g., a contact name in the template “Call [contact].”). Each candidate substring can thus be compared to some or all of the various templates of a virtual assistant.

[0214] In one example, a similarity score or probability of a match can be determined based on how similar a substring is to a user request template. In some examples, words corresponding to expected entities, arguments, or the like can be ignored in the comparison. In another example, a binary yes/no result can be produced based on whether or not one or more matching (or nearly matching) templates can be found from the comparison.

[0215] Referring to first candidate substring 922 of FIG. 9 as an example, the substring “Navigate to Jessica’s house” can be compared to some or all templates of a virtual assistant. In one example, only templates associated with navigation can be used given the keyword “Navigate.” In other examples, other or all templates can be used. In a virtual assistant, templates associated with providing maps, guidance, or navigation can include “Navigate to [location],” “Get me directions to [location],” “Show me a map of [location],” or the like. In comparing candidate substring 922 to such navigation-related templates, at least one matching template can be identified: “Navigate to [location],” where the location variable can allow the words “Jessica’s house” to be ignored for purposes of comparison. In this example, at least one matching template can be identified, so a yes result or a high similarity score or probability can be produced.

[0216] In another example, a substring might be similar to a template without actually matching the template (e.g., having extraneous words, including unexpected conjunctions, etc.). In such examples, a lower similarity score or probability can be produced, or, depending on a particular application, either a yes or a no result can be produced. In other examples, no matching or similar template may be found, and a no result or nil similarity score or probability can be produced. Candidate substrings can thus be compared to user request templates of a virtual assistant to identify matches, likelihoods of a match, similarity scores, or the like. It should be understood that any of a variety of probabilities, scores, or the like can be produced as desired for a particular application based on comparisons with virtual assistant request templates.

[0217] Instead of or in combination with semantic coherence and/or template matching, each candidate substring can be analyzed by testing them with various services of a virtual assistant. For example, each candidate substring can be submitted to one or more services of the virtual assistant (e.g., a messaging service, a navigation service, a phone service, etc.). The services can be queried to determine

whether they can resolve an actionable command from the candidate substring. In one example, services can deny a request outright or reject a substring (e.g., a zero likelihood of resolving the substring). In another example, services can be configured to produce a likelihood of being able to resolve the substring with more information (e.g., context, user data, etc.). In yet another example, services can be configured to produce a likelihood of the service being the appropriate service to handle a user request (e.g., based on domain keywords, available functions, and the like).

[0218] Referring to second candidate substring 924 of FIG. 9 as an example, a messaging service can, in some examples, produce a high likelihood of being able to resolve the substring into an actionable command. For example, in the substring “send her a message that I’m on my way,” the words “send” and “message” can correspond to messaging domain keywords or templates and can lead a messaging service to produce a high likelihood that it will be able to resolve the substring to an actionable command. In addition, the messaging service can identify that additional context may be necessary to resolve to a complete command given that “her” may not be known from the substring alone, but the messaging service can produce a moderate likelihood of being able to resolve the substring given additional contextual information. Moreover, the messaging service can compare the substring to a messaging template to recognize that the substring may likely be intended for the messaging service rather than another service. A messaging service could thus produce a high likelihood of being able to resolve candidate substring 924 into an actionable command. In contrast, a navigation service, phone service, or search service might produce a low or nil likelihood of being able to resolve candidate substring 924 based on the lack of keywords, matching templates, salient entities, and the like. Candidate substrings can thus be submitted to services to determine the likelihood that one of the services can resolve the substring to an actionable command. It should be understood that any of a variety of probabilities, likelihoods, binary results, or the like can be produced as desired for a particular application based on submission to various virtual assistant services.

[0219] In some examples, a combination of semantic coherence, template matching, and/or service testing can be used to determine a probability that a candidate substring corresponds to an actionable command. For example, the results of two or more tests can be combined using known methods (e.g., linear interpolation, etc.). In addition, a

variety of other tests or approaches can be used instead of or in addition to those discussed above to determine the probability that a candidate substring corresponds to an actionable command. For example, ontologies could be used to attempt to resolve a candidate substring into an actionable command, and a probability can be produced based on the success or failure of the ontology traversal. Various other approaches can also be used to test candidate substrings and verify the accuracy of a parse.

[0220] Referring again to process 800 of FIG. 8, at block 810, a determination can be made as to whether the probabilities determined at block 808 exceed a threshold. For example, a minimum threshold can be determined below which a particular parse can be deemed unlikely or unacceptable. In some examples, the probability of each candidate substring corresponding to an actionable command can be compared to a threshold level, and the failure of any candidate substring of a parse to meet the level can be deemed a failure of the parse leading to the “no” branch of block 810. In other examples, the probabilities of each candidate substring of a parse can be combined in a variety of ways (e.g., normalization, linear interpolation, etc.) and then compared to a threshold. The threshold level can be determined empirically, based on virtual assistant thresholds, or the like.

[0221] In other examples, however, block 808 (and block 810) can be omitted from process 800. For example, in some instances, a parse can be determined to be sufficiently accurate such that additional probability testing or verification may be unnecessary. Common user requests, common combinations in multi-part commands, high probabilities of semantically meaningful parses, or the like can be used to determine that a parse may be trusted enough to proceed without additional verification or accuracy testing. Moreover, in some examples, the approach used to parse a multi-part command can be sufficiently accurate so as to warrant omitting verification or accuracy testing. The testing described with regard to block 808 can thus be optional.

[0222] If the probabilities from block 808 fail to meet or exceed the threshold at block 810 (e.g., the “no” branch), in some examples, process 800 can return to block 806 to attempt a different parse of the text string. For example, given the failure of the parse through the first pass, a new parse can be attempted or an adjustment can be made at block 806 to attempt to identify a more accurate parse on a second or subsequent pass. In other examples, however, most or all possible parses can be tested simultaneously,

in which case a failure at block 810 can result in the virtual assistant querying for more information, asking for a repeat of the commands, returning a failure message, or the like. Similarly, should repeated parses fail to yield an accurate result, the virtual assistant can query for more information, ask for a repeat of the commands, return a failure message, or the like. In some examples, if one or more of a set of candidate substrings of a parse exceeds a threshold, those candidate substrings can be processed further as discussed below while the virtual assistant addresses the remaining (failing) substring or substrings through dialogue, error messages, or the like. In this manner, portions of a multi-part voice command can be handled whether or not other portions can be accurately resolved without additional information.

[0223] If the probabilities from block 808 meet or exceed the threshold at block 810 (e.g., the “yes” branch), process 800 can continue to block 812. At block 812, a first intent associated with the first candidate substring and a second intent associated with the second candidate substring can be determined. In one example, a virtual assistant can determine a user’s intent from speech input by matching the user’s speech to a particular domain with tasks, processes, and the like that the virtual assistant can perform or execute. Determining a user’s intent can also include resolving ambiguous words, pronouns, and the like using context (e.g., user data, displayed information, previous requests, etc.). Thus, at block 812, an intent can be determined for each candidate substring in preparation for performing according to the user’s multi-part command.

[0224] In some examples, information from previous blocks of process 800 can be used to determine user intent at block 812. For example, domain keywords, request templates, service matching, and the like from previous blocks discussed above can be used to identify the user intent of a particular candidate substring.

[0225] Referring to the example of FIG. 9, an intent can be determined for first candidate substring 922 and second candidate substring 924. In one example, first candidate substring 922 can be matched to the navigation domain based on the command word “Navigate.” A matching template “Navigate to [location]” can also be identified within that domain. The location “Jessica’s house” can then be resolved using user data, such as identifying a house address from the user’s contact information for a contact named Jessica.

[0226] Second candidate substring 924 can be matched to a messaging domain based on the words “send” and “message” and/or a corresponding template. For example, a template “send [recipient] a message that [message]” can be identified. The recipient can be resolved based on the context of the previous request from first candidate substring 922. In particular, the intended recipient “Jessica” (and her contact information from the user’s contacts) can be identified to replace “her” based on the previous command in the multi-part command. The text in the message variable can be transcribed directly from the substring (e.g., “I’m on my way.”).

[0227] In another example, context from a previous command in a multi-part command can similarly be used to resolve ambiguous words. In the multi-part command “Send Steve a message that I’ll be late, and remind me to call him in twenty minutes,” the pronoun “him” can be ambiguous without the context of the prior command. In particular, in one example, a first actionable command can be identified for sending Steve a message saying “I’ll be late.” The second actionable command, however, can utilize the context of the previous command for accurate intent interpretation of which person the user would like to be reminded to call in twenty minutes. The intent of the second command can thus be interpreted based on the context of the previous command in the utterance to accurately determine that the user would like to be reminded to call Steve in twenty minutes.

[0228] A variety of other contextual information can similarly be used to determine user intent for a particular candidate substring. For example, FIG. 10 illustrates exemplary user device 104 with display 1030 having context for interpreting a multi-part voice command. It should be understood that FIG. 10 illustrates one example of a user device 104 according to various examples herein, but many other examples are possible (including devices without displays, devices with different proportions, and the like). Likewise, it should be appreciated that although display 1030 is illustrated as being incorporated with user device 104 (e.g., as a touchscreen), in other examples, display 1030 can be separate from user device 104 (e.g., as in a television, computer monitor, separate user device, or the like).

[0229] In one example, when viewing the content shown in FIG. 10, a user can utter a multi-part command, such as “Save that picture, send it to my dad, and set it as my home screen wallpaper.” Such a multi-part command could be parsed into three candidate substrings: “Save that picture,” “send it to my dad,” and “set it as my home

screen wallpaper.” For the first substring, the subject “that picture” can be ambiguous without additional contextual information. Here, the content displayed on display 1030, including links 1034 and picture 1032, can be used to disambiguate (or resolve) the first substring. In particular, given the context of the appearance of picture 1032 on display 1030, the subject “that picture” can be resolved to picture 1032. The user’s intent for the first substring can thus be determined to be saving picture 1032 (e.g., to memory on the user’s device). Other content elements can similarly be used as context, including displayed text, emails, notifications, reminders, albums, songs, lists, calendar entries, or the like.

[0230] The second and third substrings can be similarly ambiguous with the pronoun “it” in “send it to my dad” and “set it as my home screen wallpaper.” To resolve the ambiguity, context from the resolved first substring can be used. In particular, the resolution of the subject “that picture” to picture 1032 on display 1030 can be used to identify the intended subject of the second and third substrings. The user intent of the second substring can thus be determined to be sending picture 1032 to a user’s father (e.g., as identified in a contact list or the like), and the user intent of the third substring can be determined to be setting picture 1032 as a home screen wallpaper of a user’s device. Displayed content can thus be used as context for interpreting user intent from user speech, and commands can be disambiguated based on previously issued commands within the same utterance (or from a previous utterance).

[0231] FIG. 11 illustrates exemplary user device 104 with display 1030 having multiple notifications of various types that can be used as context for interpreting multi-part voice commands. In particular, display 1030 shows notifications 1040, including emails 1142, messages 1144 (e.g., instant messages, text messages, etc.), reminders 1146, and meeting request 1148. A multi-part voice command as discussed herein can be an efficient way for a user to manage multiple notifications at one time. For example, a user might utter “Reply to those emails with my out of office reply, remind me to call mom in twenty minutes, tell Joe sure, snooze those reminders an hour, and accept that meeting request.” In one example, such a lengthy multi-part command can be uttered with pauses while a user thinks about next actions, and a virtual assistant can continue to await further commands without interrupting the user (e.g., based on a button being held down, a user preference or setting, or the like). In addition, a virtual assistant can begin to take action immediately upon interpreting

user intent for one command without waiting to resolve subsequent commands in a multi-part command. For example, a virtual assistant might begin sending out of office emails to Jane Doe and Jennifer Smith while the user continues with commands related to messages 1144, reminders 1146, and meeting request 1148. In other examples, a virtual assistant can wait for a user to finish all commands before beginning to execute processes associated with them.

[0232] A multi-part command associated with the content shown in FIG. 11 can be disambiguated (as needed) using the types of notifications displayed, names associated with those notifications, details about those notifications, or the like. For example, for the substring “Reply to those emails with my out of office reply,” the subject “those emails” can be ambiguous, but the content displayed can be used to determine that “those emails” correspond to emails 1142 shown on display 1030. In particular, the email notification or content type can be used to accurately associate “those emails” with the displayed email-related notifications. Similarly, the substring “tell Joe sure” can be ambiguous (e.g., which Joe), but the content displayed can be used to determine that “Joe” corresponds to the sender of one of messages 1144. In particular, the name “Joe” can be checked against names shown on display 1030 (as well as against user contacts and the like) to accurately identify which Joe the user intended.

[0233] The substring “snooze those reminders an hour” can similarly be ambiguous, but the content displayed can be used to determine that “those reminders” correspond to reminders 1146 shown on display 1030. In particular, the reminder notification type can be used to accurately associate “those reminders” with reminders 1146. Finally, the substring “accept that meeting request” can similarly be ambiguous, but the content displayed can be used to determine that “that meeting request” corresponds to meeting request 1148 shown on display 1030. In particular, the meeting request notification type can be used to accurately associate “that meeting request” with meeting request 1148.

[0234] In other examples, a user can reference notifications 1040 in other ways, and the displayed content can similarly be used to disambiguate a user’s request. For example, a user can reference notifications by type (e.g., mail, reminder, etc.), names (e.g., Jane, Jennifer, Mom, etc.), subject matter (e.g., dinner invitation, report on

progress, milk, progress report meeting, etc.), position reference or ordinal descriptor (e.g., the top two, the first email, the second reminder, the last three, etc.), or the like.

[0235] FIG. 12 illustrates exemplary user device 104 with display 1030 having multiple emails 1142 shown in email application 1250 that can be used as context for interpreting a multi-part voice command. A multi-part voice command as discussed herein can be an efficient way for a user to manage lists of items, including the list of emails 1142 illustrated in FIG. 12. It should be understood that email application 1250 is provided as an example of how emails might be displayed in a list, but many other configurations are possible (e.g., including a preview pane or the like), and any type of list can be used as context for interpreting multi-part voice commands.

[0236] In one example, a user can refer to listed emails 1142 by ordinal descriptors in issuing commands. For example, a user might utter “Send my out of office reply to the first three, add the sender of the last one to the blocked contact list, and move the last one to spam.” The ordinal position of emails 1142 within the list can then be used to disambiguate the user’s multi-part command. The descriptor “first three” in the first substring can be ambiguous, but the content displayed can be used to determine that “the first three” corresponds to the first three emails 1142 shown on display 1030 (e.g., emails from Jane, Jennifer, and Alan). In particular, the ordinal position of the first three emails can be used to accurately associate “the first three” with the first, second, and third emails 1142 in the list to determine the user’s intent. Similarly, the descriptor “the last one” in the second and third substrings can be ambiguous, but the content displayed can be used to determine that “the last one” corresponds to the last email 1142 shown on display 1030 (e.g., the email from Investor Tip Co.). In particular, the ordinal position of the fourth and final email in the list can be used to accurately associate “the last one” with the fourth email 1142 in the list to determine the user’s intent. In other examples, a user can refer to listed items in other ways that can be similarly disambiguated (e.g., second email, third reminder, second to last, penultimate, final, middle one, last two entries, top three items, bottom four, etc.).

[0237] In other examples, a user can refer to an entire list of content in issuing commands. For example, a user might utter “Mark all of those as read, and move them all to trash.” The appearance of a list of emails 1142 on display 1030 can be used to disambiguate the user’s multi-part command. The descriptors “all of those” and “them all” can be ambiguous, but the content displayed can be used to determine

that “all of those” and “them all” correspond to the complete list of four emails 1142 shown in FIG. 12. In still other examples, various other ambiguous reference terms can be employed and similarly disambiguated based on list content.

[0238] In addition to using displayed content to disambiguate terms in a multi-part command, various other methods can be employed for determining user intent for candidate substrings. In one example, potential (or likely) user requests can be determined based on displayed information, and user intent can be determined based on the potential user requests. Referring again to FIG. 12 as an example, a user may be likely to issue a certain set of commands related to email management when viewing emails 1142 in email application 1250. For example, potential user requests related to email management can include replying, deleting, moving, filing, forwarding, marking as read, marking as unread, marking as spam, archiving, blocking a sender, and the like. When determining user intent for substrings, these potential user requests can be given additional weight or priority, or can be used as a comparison (e.g., comparing templates) to accurately interpret user commands. In particular, based on emails 1142 appearing on display 1030, potential user requests associated with email management can be used in interpreting user commands based on at least some likelihood that a user will issue commands associated with what is displayed.

[0239] In other examples, potential user requests can be determined based on a variety of other content to provide accurate intent interpretation. For example, referring again to FIG. 11, potential user requests can be identified for handling notifications 1140, and these potential user requests can be used in determining user intent. Associated commands can include dismissing an item, snoozing a reminder, replying to a message, accepting a meeting request, proposing a new time for a meeting, or the like. In another example, referring again to FIG. 10, potential user requests can be identified for interacting with the displayed content, including links 1034 and picture 1032, and these potential user requests can be used in determining user intent. Associated commands can include saving a picture, sharing a picture, sharing a link, printing a page, selecting a displayed item, or the like. Potential user requests can thus be identified based on displayed content, and the identified potential user requests can be used to determine user intent for substrings in a multi-part command.

[0240] Referring again to process 800 of FIG. 8, at block 814, a first process associated with the first intent and a second process associated with the second intent can be executed. With user intents determined for each candidate substring (or some candidate substrings), the processes associated with the user intents can be executed. For example, messages can be composed and sent, emails can be deleted, notifications can be dismissed, or the like. In some examples, multiple tasks or processes can be associated with individual user intents, and the various tasks or processes can be executed at block 814. In other examples, the virtual assistant can engage the user in a dialogue to acquire additional information as necessary for completing task flows. As mentioned above, in some examples, if only a subset of the substrings of a multi-part command can be interpreted into user intents, the processes associated with those user intents can be executed, and the virtual assistant can handle the remaining substrings in a variety of ways (e.g., request more information, return an error, etc.).

[0241] Referring again to process 800 of FIG. 8, at block 816, an acknowledgment associated with the first intent and the second intent can be provided to the user. For example, an acknowledgment can be provided to the user to indicate acceptance of one or more commands, status of executing various commands, interpretations of various commands, errors associated with particular commands, information being needed for some commands, or the like. In one example, such an acknowledgment can include an audible confirmation (e.g., a tone, spoken words, or the like). For example, a virtual assistant can repeat back to the user a list of commands—as interpreted—as confirmation (or to allow the user the opportunity to correct, interject, cancel, etc.). In another example, a confirmatory tone can be played to indicate valid interpretation of a user's commands. Various other audible forms of feedback can likewise be used.

[0242] In another example, acknowledgment of a multi-part command can include haptic feedback. For example, a user device can be vibrated to either confirm valid interpretation of a user's commands or to indicate an error or lack of information. Haptic feedback can also be performed in patterns to indicate certain information, such as vibrating a set number of pulses to indicate the number of identified commands.

[0243] In yet another example, acknowledgment of a multi-part command can include providing tasks to the user by, for example, speaking the tasks and/or displaying them

on a display. In particular, user intents (e.g., the first intent and the second intent of blocks 812, 814, and 816 of process 800) can be associated with particular virtual assistant tasks, and the virtual assistant can paraphrase those tasks and provide them to the user by, for example, speaking and/or displaying them.

[0244] FIG. 13 illustrates exemplary user device 104 with display 1030 showing paraphrased tasks 1360 associated with a multi-part command. It should be understood that tasks 1360 can be spoken instead of or in addition to being displayed. As illustrated, three tasks are displayed as an acknowledgment to the user of a multi-part command. For example, such a command might have been uttered with reference to FIG. 12, and could include a multi-part command such as “Put the last email into spam, and add its sender to the blocked list, and reply to the first three saying I’m on vacation in Bali.” Three substrings may have been identified that could be associated with the paraphrased tasks shown in FIG. 13. In particular, a first paraphrased task can include “Put ‘Great New Opportunity’ email into spam folder,” a second paraphrased task can include “Add ‘Investor Tip Co.’ to blocked sender list,” and a third paraphrased task can include “Send email to Jane, Jennifer, and Alan: ‘I’m on vacation in Bali.’” Acknowledgment of a multi-part user command can thus include providing a paraphrased task to the user for each interpreted command by speaking and/or displaying them.

[0245] In some examples, paraphrased tasks can be displayed within a dialogue interface of a virtual assistant (e.g., in a conversation format), with or without a transcription of a user’s speech. In other examples, paraphrased tasks can be displayed in a pop-up window, notification area, or the like. In still other examples, displayed tasks 1360 (or a transcription of a user’s speech) can be selectable for editing, canceling, prioritizing, or the like. For example, a user can select one of tasks 1360, and a menu of actions can be provided for editing the task parameters, canceling the task, prioritizing the task, delaying the task, or the like. In another example, a default action can be associated with selecting a displayed task, such as editing the task, pausing the task, canceling the task, or the like.

[0246] Moreover, in some examples, completion indicators and/or status indicators can be provided to the user by, for example, playing an associated indicator tone, speaking an associated status indicator, or displaying associated indicators. FIG. 13 illustrates exemplary indicators associated with tasks 1360. In one example, upon

completion of a process or task, a completion indicator can be provided to the user, such as displaying checkmark 1362 by the first task 1360 to indicate completion. In another example, a tone could be played or words could be spoken to indicate completion (e.g., “first task completed,” or the like).

[0247] In another example, while a process or task is still being executed (before completion), a processing status indicator can be provided to the user. Status could be provided by sounding a tone or speaking the status (e.g., “processing the second task,” or the like). Status could also be provided by displaying a processing status indicator such as hourglass 1364 and/or status bar 1366 (or an empty box where checkmark 1362 can be placed upon completion of the task). In one example, hourglass 1364 can indicate that the task is still being executed. In other examples, however, hourglass 1364 can indicate that more information is needed, that the request is still being interpreted, that a search is being conducted, or the like. Status bar 1366 can also be used to indicate task execution status, and can reflect the percentage of completion of a particular task. In other examples, processing status indicators can include animations, graphs, font changes (e.g., text color, size, etc.), or the like.

[0248] Various other acknowledgments can also be provided to a user to convey information about a multi-part command (e.g., illuminating indicator lights, animating emails being trashed, animating messages being composed and sent, etc.). In addition, any combination of acknowledgments can be provided, such as displaying a list of tasks, speaking the tasks aloud, and displaying status and completion indicators.

[0249] Furthermore, in some examples, acknowledgments can be provided while a user is still uttering commands. For example, confirmatory tones, haptic feedback, speech, or the like can be provided to a user upon, for example, detecting a complete actionable command. In particular, a virtual assistant can briefly speak “okay,” play a tone, vibrate a user device, display user speech, or the like as commands are being spoken. This can provide confirmation to a user that a command is understood, thereby allowing the user to continue issuing commands with confidence that the virtual assistant is handling the commands along the way.

[0250] In other examples, the virtual assistant can provide visual confirmation to the user that it is recognizing multiple commands in a single stream of user speech. FIG. 14A and FIG. 14B illustrate exemplary virtual assistant interfaces 1470 for conveying

recognition of a multi-part voice command on display 1030 of user device 104. In one example, different commands recognized within a stream of user speech can be emphasized differently than other commands to indicate that the virtual assistant has correctly recognized that a multi-part command is being issued. In one example, such emphasis can be added after the user finishes speaking. In other examples, however, the user's speech can be transcribed as the user speaks, and the candidate substrings can be dynamically emphasized differently while the transcribed text is streaming on a display of a user device. This dynamic feedback while the user is speaking can confirm to the user that the virtual assistant is understanding that a multi-part command is being issued, which can allow the user to confidently continue to issue commands as desired.

[0251] FIG. 14A illustrates one example of emphasizing different candidate substrings differently in a virtual assistant interface 1470. As illustrated, interface 1470 can include a conversational dialogue interface with assistant greeting 1472 prompting a user to make a request. Transcribed user speech 1474 illustrates one example of differently emphasizing candidate substrings in user speech as it is transcribed. In particular, the first candidate substring is shown in bold, italic, and underlined text. The second candidate substring is shown in bold, underlined text. The third candidate substring is shown in italic, underlined text. In this manner, different candidate substrings or commands can be emphasized so as to convey that the virtual assistant recognizes that a multi-part command is being issued, and that the virtual assistant is correctly recognizing the different commands individually.

[0252] In the example of FIG. 14A, transcribed user speech 1474 is shown as incomplete as the user may still be issuing a command. In particular, the third command begins with "reply to the first three saying," but the text of the associated message has not yet been spoken. In some examples, auto-complete suggestions 1476 can be displayed, and the user can select one of the auto-complete suggestions to complete a command that is currently being issued. For example, the user can tap on the auto-complete suggestion "I'm out of the office" to complete the third command and provide the message text of the reply. In other examples, auto-complete suggestions 1476 can provide example commands related to previous commands in an utterance, commands related to objects shown on a display, commands frequently issued by the user, or the like. Moreover, in some examples, auto-complete

suggestions 1476 can be positioned next to, in-line with, or in another position relative to the current command being issued. For example, auto-complete suggestions 1476 can be positioned near an object or partial command and connected to it with a line or other graphical association (e.g., dots).

[0253] FIG. 14B illustrates another example of emphasizing different candidate substrings differently in a virtual assistant interface 1470. In particular, transcribed user speech 1478 illustrates emphasizing different candidate substrings using tag-cloud-like clustering. In one examples, the various commands can be spatially separated with the words of each command clustered together. In some examples, words that can be edited, keywords, command words, subject words, or otherwise important words can be emphasized with bold text, larger font size, or the like. In other examples, words can be emphasized differently based on importance. For example, the primary command word (e.g., send) can be shown in the largest, boldest font, subject words (e.g., recipient names) can be shown in a medium font, and other words can be shown in a small font. The words can be clustered together in variety of ways, including out of order and in different orientations. In some examples, different commands can be sized differently based on interpretation confidence associated with a command (e.g., how confident the virtual assistant is that the interpretation is accurate based on the user's speech). Command clusters can be separated and displayed as a user is speaking commands or after a user finishes speaking a multi-part command. Various other cluster-type displays can also be used to emphasize multi-part command distinctions.

[0254] Different commands or candidate substrings in a multi-part command can also be emphasized in a variety of other ways. For example, individual commands can be circled, outlined, or otherwise separated by drawing graphical markers (e.g., drawing a shape around a command, drawing separating lines or graphics between commands, placing different commands in different speech bubbles, or the like). In another example, different commands can be colored differently (e.g., red text for a first command, green text for a second command, blue text for a third command, etc.). In yet another example, various combinations of the above approaches can be used to differently emphasize different candidate substrings, commands, tasks, or the like (e.g., using differently colored words within a clustered command that is spatially separated from another clustered command). Accordingly, using any of these various

visual display approaches, the virtual assistant can show that multiple commands are being recognized in a single stream. Moreover, in other examples, these visual display approaches can be combined with other forms of feedback (e.g., audible, haptic, etc.) discussed herein.

[0255] Process 800 of FIG. 8 can thus be used to handle multi-part commands. As noted above, and as will be understood by one of ordinary skill in the art, various modifications can be made, including removing blocks of process 800, modifying the order of operations, expanding the quantities of various operations, or the like.

[0256] In addition, in any of the various examples discussed herein, various aspects can be personalized for a particular user. As discussed above, user data including contacts, preferences, location, and the like can be used to interpret voice commands. The various processes discussed herein can also be modified in various other ways according to user preferences, contacts, text, usage history, profile data, demographics, or the like. In addition, such preferences and settings can be updated over time based on user interactions (e.g., frequently uttered commands, frequently selected applications, etc.). Gathering and use of user data that is available from various sources can be used to improve the delivery to users of invitational content or any other content that may be of interest to them. The present disclosure contemplates that in some instances, this gathered data can include personal information data that uniquely identifies or can be used to contact or locate a specific person. Such personal information data can include demographic data, location-based data, telephone numbers, email addresses, home addresses, or any other identifying information.

[0257] The present disclosure recognizes that the use of such personal information data, in the present technology, can be used to the benefit of users. For example, the personal information data can be used to deliver targeted content that is of greater interest to the user. Accordingly, use of such personal information data enables calculated control of the delivered content. Further, other uses for personal information data that benefit the user are also contemplated by the present disclosure.

[0258] The present disclosure further contemplates that the entities responsible for the collection, analysis, disclosure, transfer, storage, or other use of such personal information data will comply with well-established privacy policies and/or privacy

practices. In particular, such entities should implement and consistently use privacy policies and practices that are generally recognized as meeting or exceeding industry or governmental requirements for maintaining personal information data as private and secure. For example, personal information from users should be collected for legitimate and reasonable uses of the entity and not shared or sold outside of those legitimate uses. Further, such collection should occur only after receiving the informed consent of the users. Additionally, such entities would take any needed steps for safeguarding and securing access to such personal information data and ensuring that others with access to the personal information data adhere to their privacy policies and procedures. Further, such entities can subject themselves to evaluation by third parties to certify their adherence to widely accepted privacy policies and practices.

[0259] Despite the foregoing, the present disclosure also contemplates examples in which users selectively block the use of, or access to, personal information data. That is, the present disclosure contemplates that hardware and/or software elements can be provided to prevent or block access to such personal information data. For example, in the case of advertisement delivery services, the present technology can be configured to allow users to select to “opt in” or “opt out” of participation in the collection of personal information data during registration for services. In another example, users can select not to provide location information for targeted content delivery services. In yet another example, users can select not to provide precise location information, but permit the transfer of location zone information.

[0260] Therefore, although the present disclosure broadly covers use of personal information data to implement one or more various disclosed examples, the present disclosure also contemplates that the various examples can also be implemented without the need for accessing such personal information data. That is, the various examples of the present technology are not rendered inoperable due to the lack of all or a portion of such personal information data. For example, content can be selected and delivered to users by inferring preferences based on non-personal information data or a bare minimum amount of personal information, such as the content being requested by the device associated with a user, other non-personal information available to the content delivery services, or publicly available information.

[0261] In accordance with some examples, FIG. 15 shows a functional block diagram of an electronic device 1500 configured in accordance with the principles of the various described examples. The functional blocks of the device can be implemented by hardware, software, or a combination of hardware and software to carry out the principles of the various described examples. It is understood by persons of skill in the art that the functional blocks described in FIG. 15 can be combined or separated into sub-blocks to implement the principles of the various described examples. Therefore, the description herein optionally supports any possible combination or separation or further definition of the functional blocks described herein.

[0262] As shown in FIG. 15, electronic device 1500 can include an input unit 1502 configured to receive information (e.g., a microphone for capturing user speech, a device for receiving user speech through a network, etc.). Electronic device 1500 can further include an output unit 1504 configured to output information (e.g., a speaker for playing sounds, a display for displaying information, a device for transmitting information through a network, etc.). Electronic device 1500 can further include processing unit 1506 coupled to input unit 1502 and output unit 1504. In some examples, processing unit 1506 can include a speech input receiving unit 1508, text string generating unit 1510, text string parsing unit 1512, probability determining unit 1514, intent determining unit 1516, process execution unit 1518, and acknowledgment providing unit 1520.

[0263] Processing unit 1506 can be configured to receive speech input from a user (e.g., through input unit 1502 using speech input receiving unit 1508), wherein the speech input comprises a single utterance having one or more actionable commands. Processing unit 1506 can be further configured to generate a text string (e.g., using text string generating unit 1510) based on the speech input using a speech transcription process. Processing unit 1506 can be further configured to parse the text string (e.g., using text string parsing unit 1512) into at least a first candidate substring and a second candidate substring. Processing unit 1506 can be further configured to determine (e.g., using probability determining unit 1514) a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command. Processing unit 1506 can be further configured to, in response to the first probability and the second probability exceeding a threshold, determine (e.g., using

intent determining unit 1516) a first intent associated with the first candidate substring and a second intent associated with the second candidate substring. Processing unit 1506 can be further configured to execute (e.g., using process execution unit 1518) a first process associated with the first intent and a second process associated with the second intent. Processing unit 1506 can be further configured to provide to the user (e.g., through output unit 1504 using acknowledgment providing unit 1520) an acknowledgment associated with the first intent and the second intent.

[0264] In some examples, parsing the text string (e.g., using text string parsing unit 1512) into at least the first candidate substring and the second candidate substring comprises identifying a first keyword in the text string that corresponds to a first domain to determine the first candidate substring, and identifying a second keyword in the text string that corresponds to a second domain to determine the second candidate substring. In other examples, parsing the text string (e.g., using text string parsing unit 1512) into at least the first candidate substring and the second candidate substring comprises identifying a first imperative verb in the text string to determine the first candidate substring, and identifying a second imperative verb in the text string to determine the second candidate substring.

[0265] In some examples, determining (e.g., using probability determining unit 1514) the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises determining a first semantic coherence of the first candidate substring and a second semantic coherence of the second candidate substring, and determining the first probability and the second probability based on the first semantic coherence and the second semantic coherence. In other examples, determining (e.g., using probability determining unit 1514) the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises comparing the first candidate substring and the second candidate substring to one or more user request templates, and determining the first probability and the second probability based on the comparison. In still other examples, determining (e.g., using probability determining unit 1514) the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds

to the second actionable command comprises submitting the first candidate substring and the second candidate substring to at least a first service and a second service, receiving a first likelihood that the first service can resolve the first actionable command and a second likelihood that the second service can resolve the second actionable command, and determining the first probability and the second probability based on the first likelihood and the second likelihood.

[0266] In some examples, determining (e.g., using intent determining unit 1516) the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises determining the second intent based on at least one word in the first candidate substring. In other examples, determining (e.g., using intent determining unit 1516) the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises determining the first intent or the second intent based on information displayed on a display associated with the electronic device. In some examples, the information comprises a list, and determining (e.g., using intent determining unit 1516) the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises determining the first intent or the second intent based on an ordinal descriptor in the first candidate substring or the second candidate substring, wherein the ordinal descriptor is associated with one or more items in the list. In other examples, the information comprises one or more notifications. In still other examples, the information comprises one or more emails. In some examples, determining (e.g., using intent determining unit 1516) the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises determining one or more potential user requests based on the information displayed on the display, and determining the first intent or the second intent based on the one or more potential user requests.

[0267] In some examples, the acknowledgment (e.g., from acknowledgment providing unit 1520) comprises an audible confirmation. In other examples, the acknowledgment comprises haptic feedback. In some examples, providing to the user (e.g., through output unit 1504 using acknowledgment providing unit 1520) the acknowledgment associated with the first intent and the second intent comprises providing a first task associated with the first intent and a second task associated with

the second intent. In one example, providing the first task associated with the first intent and the second task associated with the second intent comprises displaying the first task and the second task.

[0268] In some examples, processing unit 1506 can be further configured to, in response to completing the first process, provide (e.g., using acknowledgment providing unit 1520) a first indicator associated with the first task, and in response to completing the second process, provide a second indicator associated with the second task. In one example, providing the first indicator associated with the first task comprises displaying the first indicator, and providing the second indicator associated with the second task comprises displaying the second indicator. In other examples, processing unit 1506 can be further configured to, before completing the first process, provide (e.g., using acknowledgment providing unit 1520) a first processing status indicator associated with the first task, and before completing the second process, provide a second processing status indicator associated with the second task. In one example, providing the first processing status indicator associated with the first task comprises displaying the first processing status indicator, and providing the second processing status indicator associated with the second task comprises displaying the second processing status indicator. In some examples, the first indicator and the second indicator comprise a checkmark. In other examples, the first processing status indicator and the second processing status indicator comprise one or more of an hourglass, an animation, or a status bar.

[0269] In other examples, providing to the user (e.g., through output unit 1504 using acknowledgment providing unit 1520) the acknowledgment associated with the first intent and the second intent comprises displaying the first candidate substring using a first emphasis and displaying the second candidate substring using a second emphasis that is different than the first emphasis. In some examples, the first emphasis and the second emphasis comprise one or more of bold text, italic text, underlined text, circled text, outlined text, colored text, and clustered text.

[0270] The operations described above with reference to FIG. 8 are, optionally, implemented by components depicted in FIGs. 1A-1B or FIG. 15. For example, receiving operation 802, generating operation 804, parsing operation 806, determining operations 808-812, executing operation 814, and providing operation 816 are, optionally, implemented by event sorter 170, event recognizer 180, and event handler

190. Event monitor 171 in event sorter 170 detects a contact on touch-sensitive display 112, and event dispatcher module 174 delivers the event information to application 136-1. A respective event recognizer 180 of application 136-1 compares the event information to respective event definitions 186, and determines whether a first contact at a first location on the touch-sensitive surface (or whether rotation of the device) corresponds to a predefined event or sub-event, such as selection of an object on a user interface, or rotation of the device from one orientation to another. When a respective predefined event or sub-event is detected, event recognizer 180 activates an event handler 190 associated with the detection of the event or sub-event. Event handler 190 optionally uses or calls data updater 176 or object updater 177 to update the application internal state 192. In some embodiments, event handler 190 accesses a respective GUI updater 178 to update what is displayed by the application. Similarly, it would be clear to a person having ordinary skill in the art how other processes can be implemented based on the components depicted in FIGs. 1A-1B.

[0271] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles of the techniques and their practical applications. Others skilled in the art are thereby enabled to best utilize the techniques and various embodiments with various modifications as are suited to the particular use contemplated.

[0272] Although the disclosure and examples have been fully described with reference to the accompanying drawings, it is to be noted that various changes and modifications will become apparent to those skilled in the art. Such changes and modifications are to be understood as being included within the scope of the disclosure and examples as defined by the claims.

WHAT IS CLAIMED IS:

1. A method for processing a multi-part voice command, the method comprising:
at an electronic device:

receiving speech input from a user, wherein the speech input comprises
a single utterance having one or more actionable commands;

generating a text string based on the speech input using a speech
transcription process;

parsing the text string into at least a first candidate substring and a
second candidate substring;

determining a first probability that the first candidate substring
corresponds to a first actionable command and a second probability that the second
candidate substring corresponds to a second actionable command;

in response to the first probability and the second probability
exceeding a threshold, determining a first intent associated with the first candidate
substring and a second intent associated with the second candidate substring;

executing a first process associated with the first intent and a second
process associated with the second intent; and

providing to the user an acknowledgment associated with the first
intent and the second intent.

2. The method of claim 1, wherein parsing the text string into at least the first
candidate substring and the second candidate substring comprises:

identifying a first keyword in the text string that corresponds to a first domain
to determine the first candidate substring; and

identifying a second keyword in the text string that corresponds to a second
domain to determine the second candidate substring.

3. The method of any of claims 1-2, wherein parsing the text string into at least
the first candidate substring and the second candidate substring comprises:

identifying a first imperative verb in the text string to determine the first
candidate substring; and

identifying a second imperative verb in the text string to determine the second
candidate substring.

4. The method of any of claims 1-3, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

determining a first semantic coherence of the first candidate substring and a second semantic coherence of the second candidate substring; and

determining the first probability and the second probability based on the first semantic coherence and the second semantic coherence.

5. The method of any of claims 1-4, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

comparing the first candidate substring and the second candidate substring to one or more user request templates; and

determining the first probability and the second probability based on the comparison.

6. The method of any of claims 1-5, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

submitting the first candidate substring and the second candidate substring to at least a first service and a second service;

receiving a first likelihood that the first service can resolve the first actionable command and a second likelihood that the second service can resolve the second actionable command; and

determining the first probability and the second probability based on the first likelihood and the second likelihood.

7. The method of any of claims 1-6, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the second intent based on at least one word in the first candidate substring.

8. The method of any of claims 1-7, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the first intent or the second intent based on information displayed on a display associated with the electronic device.

9. The method of claim 8, wherein the information comprises a list; and wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the first intent or the second intent based on an ordinal descriptor in the first candidate substring or the second candidate substring, wherein the ordinal descriptor is associated with one or more items in the list.

10. The method of any of claims 8-9, wherein the information comprises one or more notifications.

11. The method of any of claims 8-10, wherein the information comprises one or more emails.

12. The method of any of claims 8-11, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining one or more potential user requests based on the information displayed on the display; and

determining the first intent or the second intent based on the one or more potential user requests.

13. The method of any of claims 1-12, wherein the acknowledgment comprises an audible confirmation.

14. The method of any of claims 1-13, wherein the acknowledgment comprises haptic feedback.
15. The method of any of claims 1-14, wherein providing to the user the acknowledgment associated with the first intent and the second intent comprises:
providing a first task associated with the first intent and a second task associated with the second intent.
16. The method of claim 15, wherein providing the first task associated with the first intent and the second task associated with the second intent comprises:
displaying the first task and the second task.
17. The method of any of claims 15-16, further comprising:
in response to completing the first process, providing a first indicator associated with the first task; and
in response to completing the second process, providing a second indicator associated with the second task.
18. The method of claim 17, wherein providing the first indicator associated with the first task comprises displaying the first indicator; and
wherein providing the second indicator associated with the second task comprises displaying the second indicator.
19. The method of any of claims 17-18, further comprising:
before completing the first process, providing a first processing status indicator associated with the first task; and
before completing the second process, providing a second processing status indicator associated with the second task.
20. The method of claim 19, wherein providing the first processing status indicator associated with the first task comprises displaying the first processing status indicator; and
wherein providing the second processing status indicator associated with the second task comprises displaying the second processing status indicator.

21. The method of any of claims 17-20, wherein the first indicator and the second indicator comprise a checkmark.
22. The method of any of claims 19-21, wherein the first processing status indicator and the second processing status indicator comprise one or more of an hourglass, an animation, or a status bar.
23. The method of any of claims 1-14, wherein providing to the user the acknowledgment associated with the first intent and the second intent comprises:
displaying the first candidate substring using a first emphasis and displaying the second candidate substring using a second emphasis that is different than the first emphasis.
24. The method of claim 23, wherein the first emphasis and the second emphasis comprise one or more of bold text, italic text, underlined text, circled text, outlined text, colored text, and clustered text.
25. A non-transitory computer readable storage medium storing one or more programs, the one or more programs comprising instructions, which when executed by an electronic device with a touch-sensitive display, cause the device to perform any of the methods of claims 1-24.
26. An electronic device, comprising:
one or more processors;
memory; and
one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the one or more programs including instructions, which when executed by the one or more processors, cause the device to perform any of the methods of claims 1-24.
27. An electronic device, comprising:
means for receiving speech input from a user, wherein the speech input comprises a single utterance having one or more actionable commands;

means for generating a text string based on the speech input using a speech transcription process;

means for parsing the text string into at least a first candidate substring and a second candidate substring;

means for determining a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command;

means, responsive to the first probability and the second probability exceeding a threshold, for determining a first intent associated with the first candidate substring and a second intent associated with the second candidate substring;

means for executing a first process associated with the first intent and a second process associated with the second intent; and

means for providing to the user an acknowledgment associated with the first intent and the second intent.

28. An electronic device, comprising:

one or more processors;

a memory; and

one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the one or more programs including instructions for:

receiving speech input from a user, wherein the speech input comprises a single utterance having one or more actionable commands;

generating a text string based on the speech input using a speech transcription process;

parsing the text string into at least a first candidate substring and a second candidate substring;

determining a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command;

in response to the first probability and the second probability exceeding a threshold, determining a first intent associated with the first candidate substring and a second intent associated with the second candidate substring;

executing a first process associated with the first intent and a second process associated with the second intent; and

providing to the user an acknowledgment associated with the first intent and the second intent.

29. A non-transitory computer readable storage medium storing one or more programs, the one or more programs comprising instructions, which when executed by one or more processors of an electronic device, cause the electronic device to:

receive speech input from a user, wherein the speech input comprises a single utterance having one or more actionable commands;

generate a text string based on the speech input using a speech transcription process;

parse the text string into at least a first candidate substring and a second candidate substring;

determine a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command;

in response to the first probability and the second probability exceeding a threshold, determine a first intent associated with the first candidate substring and a second intent associated with the second candidate substring;

execute a first process associated with the first intent and a second process associated with the second intent; and

provide to the user an acknowledgment associated with the first intent and the second intent.

30. An electronic device, comprising:
means for performing any of the methods of claims 1-24.

31. An electronic device, comprising:
a processing unit configured to:

receive speech input from a user, wherein the speech input comprises a single utterance having one or more actionable commands;

generate a text string based on the speech input using a speech transcription process;

parse the text string into at least a first candidate substring and a second candidate substring;

determine a first probability that the first candidate substring corresponds to a first actionable command and a second probability that the second candidate substring corresponds to a second actionable command;

in response to the first probability and the second probability exceeding a threshold, determine a first intent associated with the first candidate substring and a second intent associated with the second candidate substring;

execute a first process associated with the first intent and a second process associated with the second intent; and

provide to the user an acknowledgment associated with the first intent and the second intent.

32. The electronic device of claim 31, wherein parsing the text string into at least the first candidate substring and the second candidate substring comprises:

identifying a first keyword in the text string that corresponds to a first domain to determine the first candidate substring; and

identifying a second keyword in the text string that corresponds to a second domain to determine the second candidate substring.

33. The electronic device of any of claims 31-32, wherein parsing the text string into at least the first candidate substring and the second candidate substring comprises:

identifying a first imperative verb in the text string to determine the first candidate substring; and

identifying a second imperative verb in the text string to determine the second candidate substring.

34. The electronic device of any of claims 31-33, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

determining a first semantic coherence of the first candidate substring and a second semantic coherence of the second candidate substring; and

determining the first probability and the second probability based on the first semantic coherence and the second semantic coherence.

35. The electronic device of any of claims 31-34, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

comparing the first candidate substring and the second candidate substring to one or more user request templates; and

determining the first probability and the second probability based on the comparison.

36. The electronic device of any of claims 31-35, wherein determining the first probability that the first candidate substring corresponds to the first actionable command and the second probability that the second candidate substring corresponds to the second actionable command comprises:

submitting the first candidate substring and the second candidate substring to at least a first service and a second service;

receiving a first likelihood that the first service can resolve the first actionable command and a second likelihood that the second service can resolve the second actionable command; and

determining the first probability and the second probability based on the first likelihood and the second likelihood.

37. The electronic device of any of claims 31-36, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the second intent based on at least one word in the first candidate substring.

38. The electronic device of any of claims 31-37, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the first intent or the second intent based on information displayed on a display associated with the electronic device.

39. The electronic device of claim 38, wherein the information comprises a list; and

wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining the first intent or the second intent based on an ordinal descriptor in the first candidate substring or the second candidate substring, wherein the ordinal descriptor is associated with one or more items in the list.

40. The electronic device of any of claims 38-39, wherein the information comprises one or more notifications.

41. The electronic device of any of claims 38-40, wherein the information comprises one or more emails.

42. The electronic device of any of claims 38-41, wherein determining the first intent associated with the first candidate substring and the second intent associated with the second candidate substring comprises:

determining one or more potential user requests based on the information displayed on the display; and

determining the first intent or the second intent based on the one or more potential user requests.

43. The electronic device of any of claims 31-42, wherein the acknowledgment comprises an audible confirmation.

44. The electronic device of any of claims 31-43, wherein the acknowledgment comprises haptic feedback.

45. The electronic device of any of claims 31-44, wherein providing to the user the acknowledgment associated with the first intent and the second intent comprises:

providing a first task associated with the first intent and a second task associated with the second intent.

46. The electronic device of claim 45, wherein providing the first task associated with the first intent and the second task associated with the second intent comprises: displaying the first task and the second task.

47. The electronic device of any of claims 45-46, wherein the processing unit is further configured to:
in response to completing the first process, provide a first indicator associated with the first task; and
in response to completing the second process, provide a second indicator associated with the second task.

48. The electronic device of claim 47, wherein providing the first indicator associated with the first task comprises displaying the first indicator; and
wherein providing the second indicator associated with the second task comprises displaying the second indicator.

49. The electronic device of any of claims 47-48, wherein the processing unit is further configured to:
before completing the first process, provide a first processing status indicator associated with the first task; and
before completing the second process, provide a second processing status indicator associated with the second task.

50. The electronic device of claim 49, wherein providing the first processing status indicator associated with the first task comprises displaying the first processing status indicator; and
wherein providing the second processing status indicator associated with the second task comprises displaying the second processing status indicator.

51. The electronic device of any of claims 47-50, wherein the first indicator and the second indicator comprise a checkmark.

52. The electronic device of any of claims 49-51, wherein the first processing status indicator and the second processing status indicator comprise one or more of an hourglass, an animation, or a status bar.

53. The electronic device of any of claims 31-44, wherein providing to the user the acknowledgment associated with the first intent and the second intent comprises:
displaying the first candidate substring using a first emphasis and displaying the second candidate substring using a second emphasis that is different than the first emphasis.

54. The electronic device of claim 53, wherein the first emphasis and the second emphasis comprise one or more of bold text, italic text, underlined text, circled text, outlined text, colored text, and clustered text.

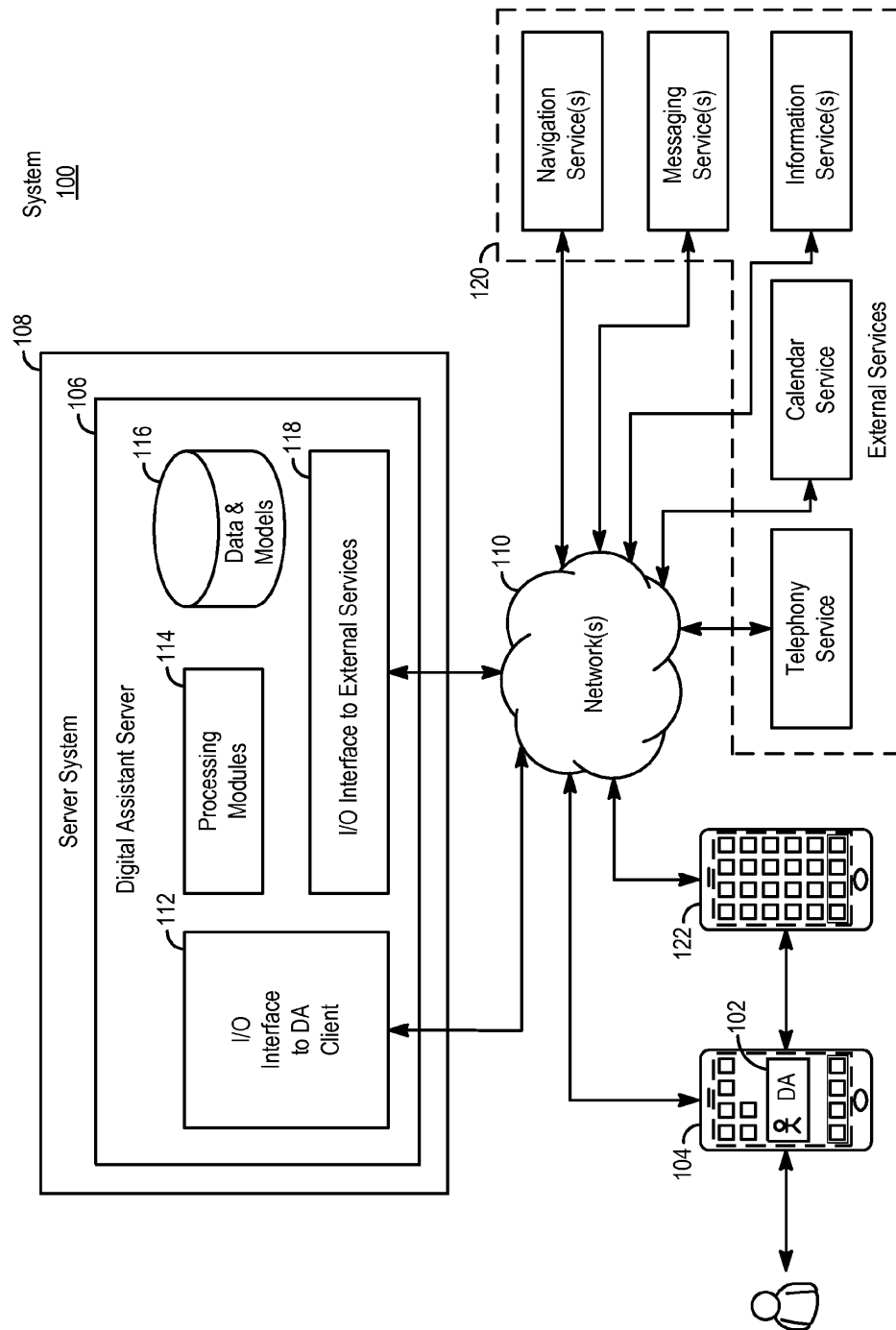


FIG. 1

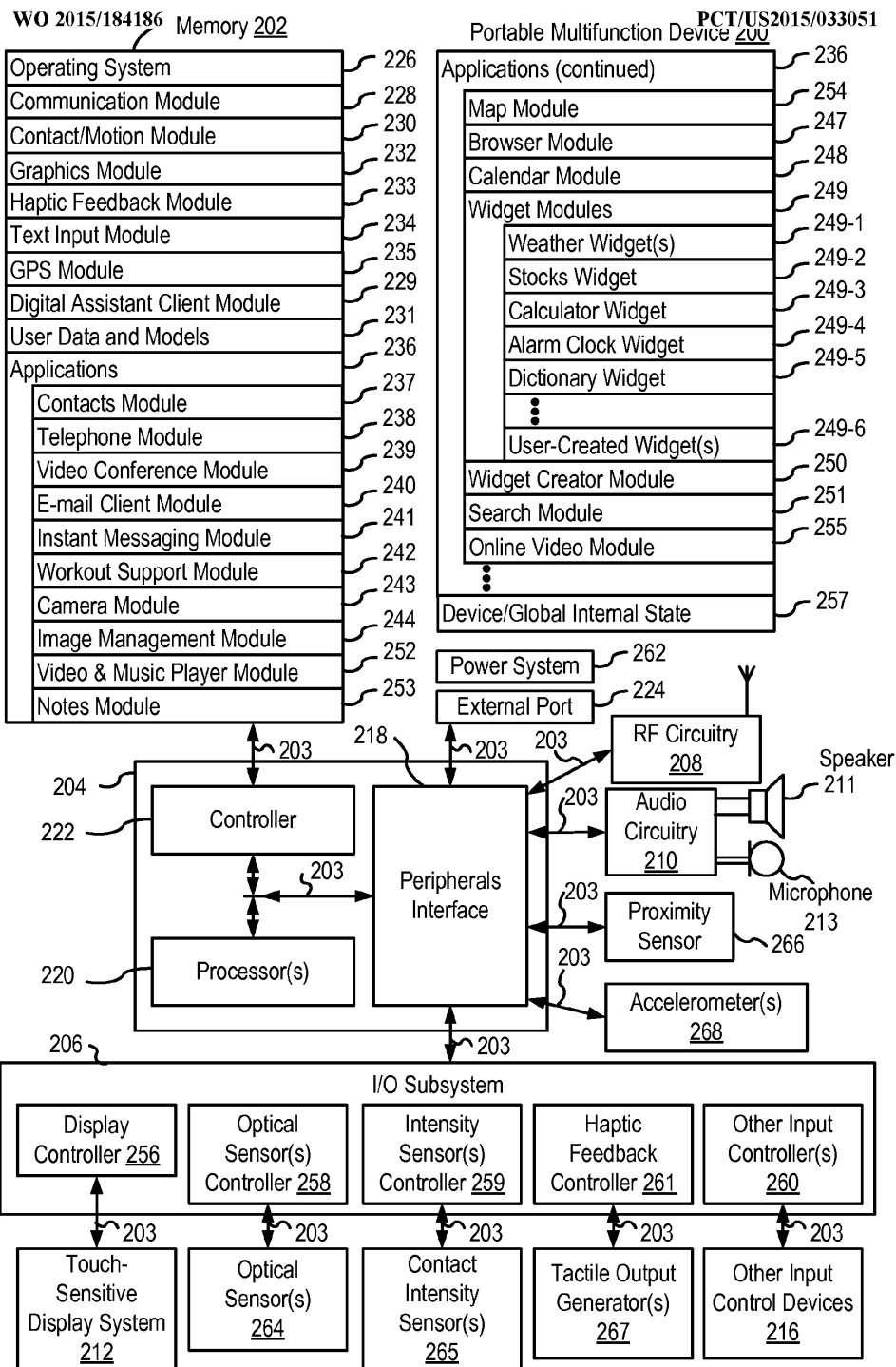


FIG. 2A

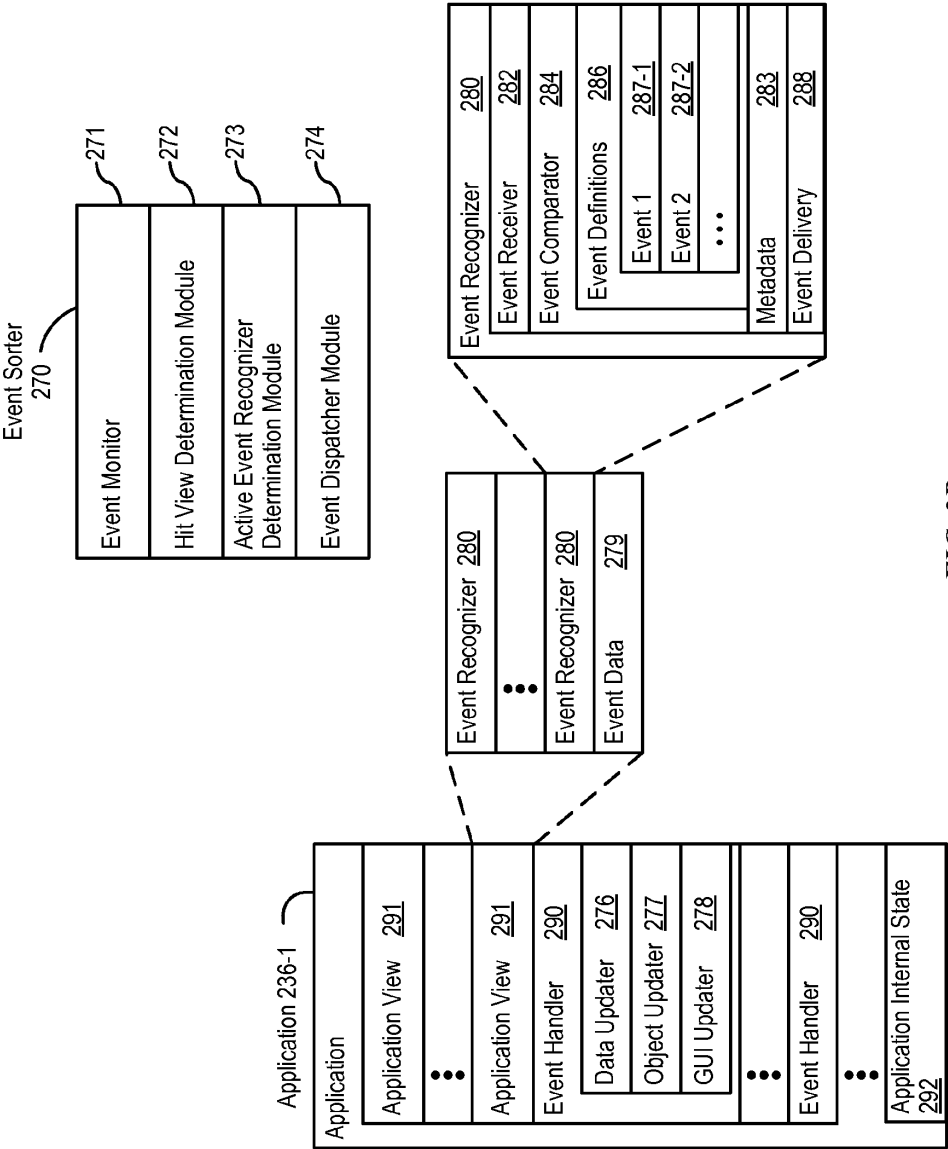
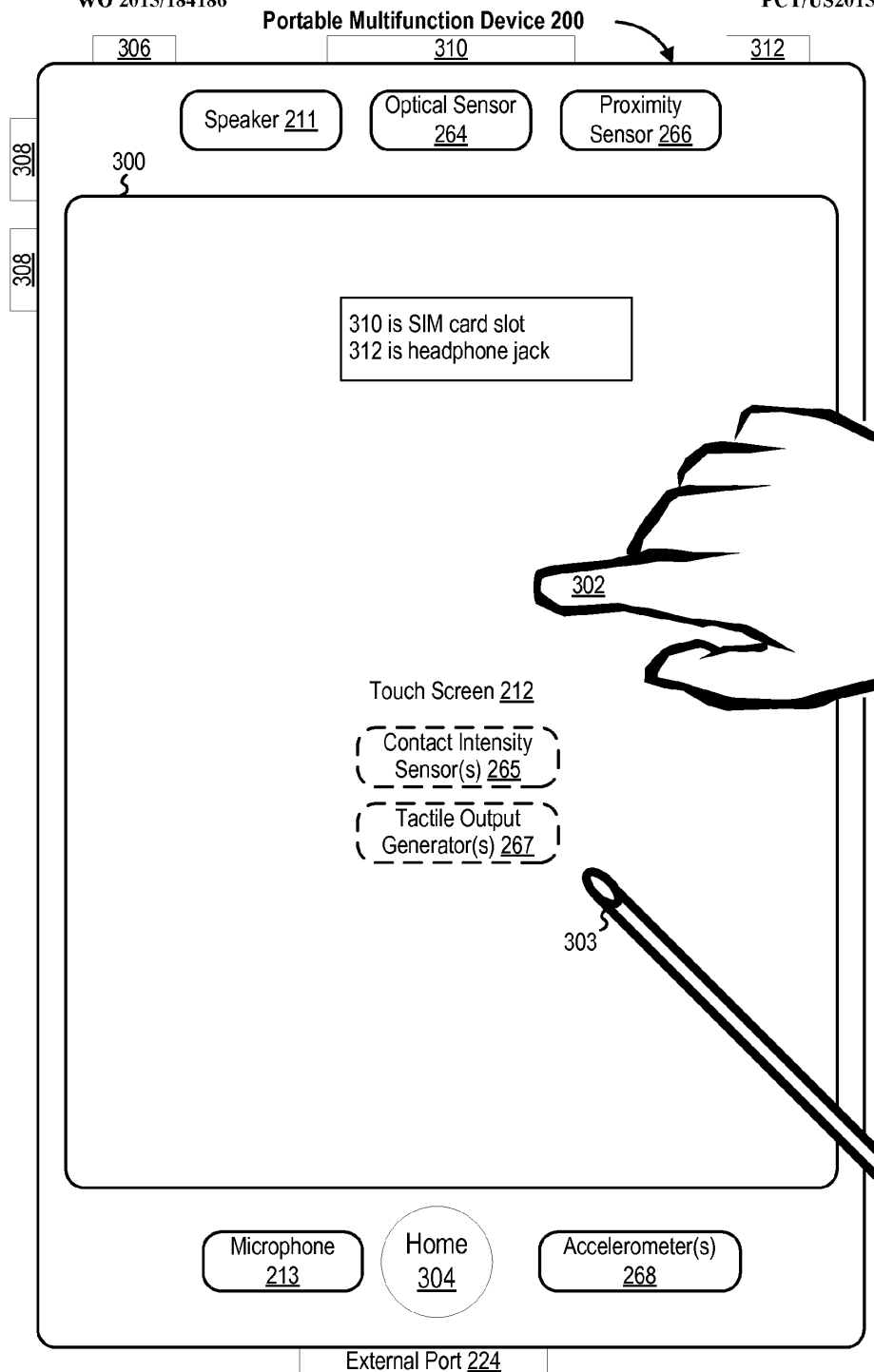


FIG. 2B

**FIG. 3**

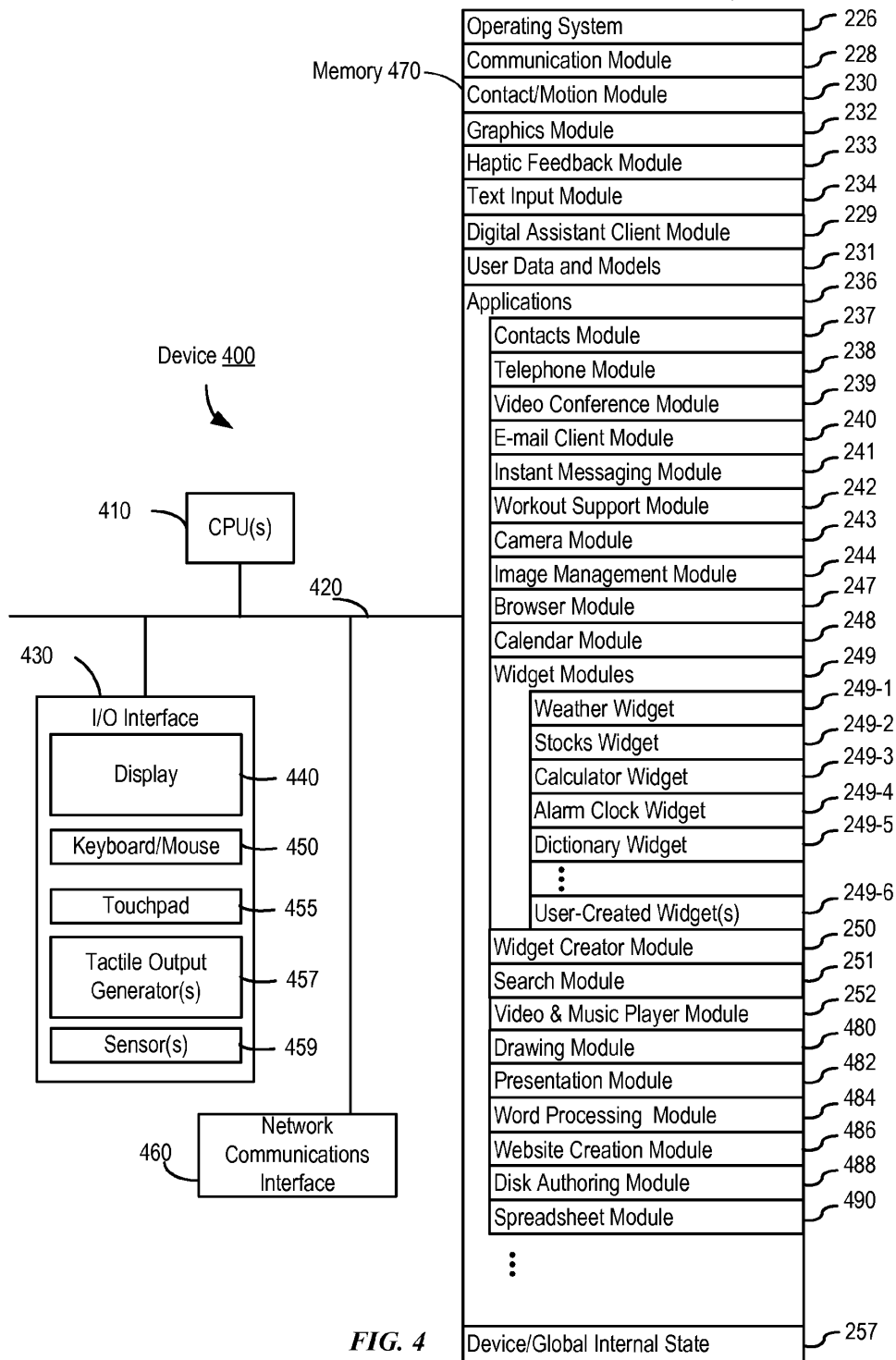


FIG. 4

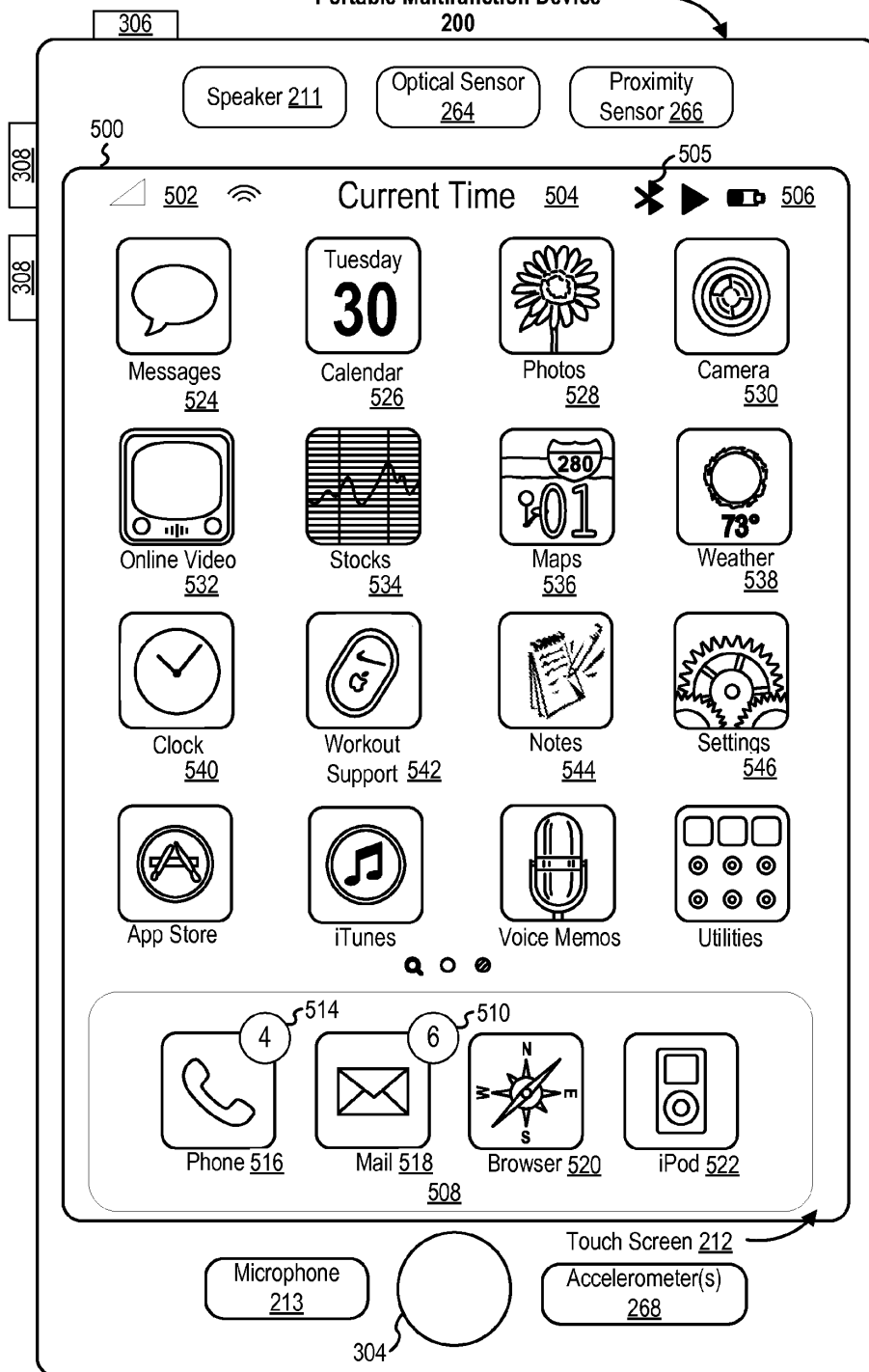


FIG. 5A

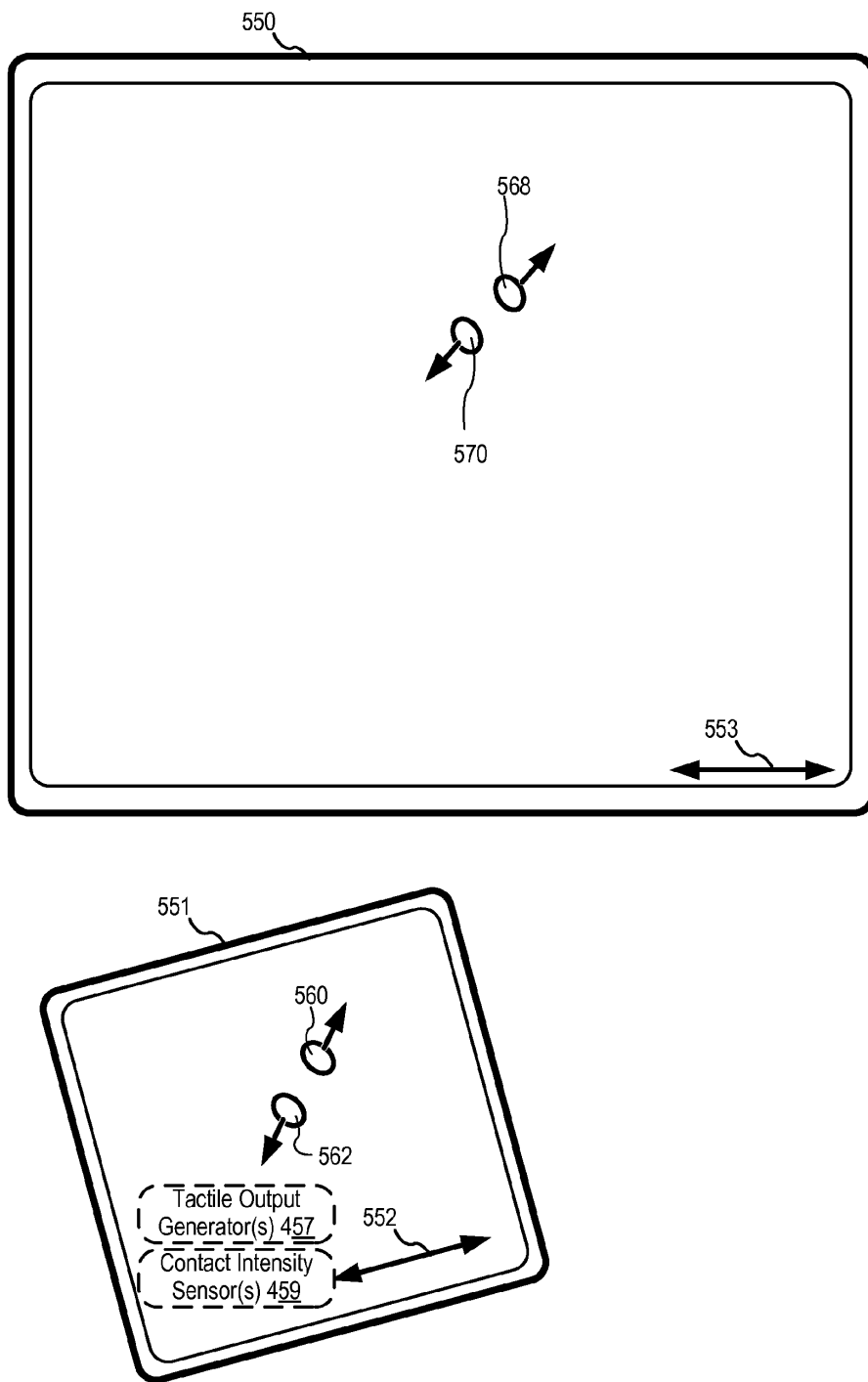
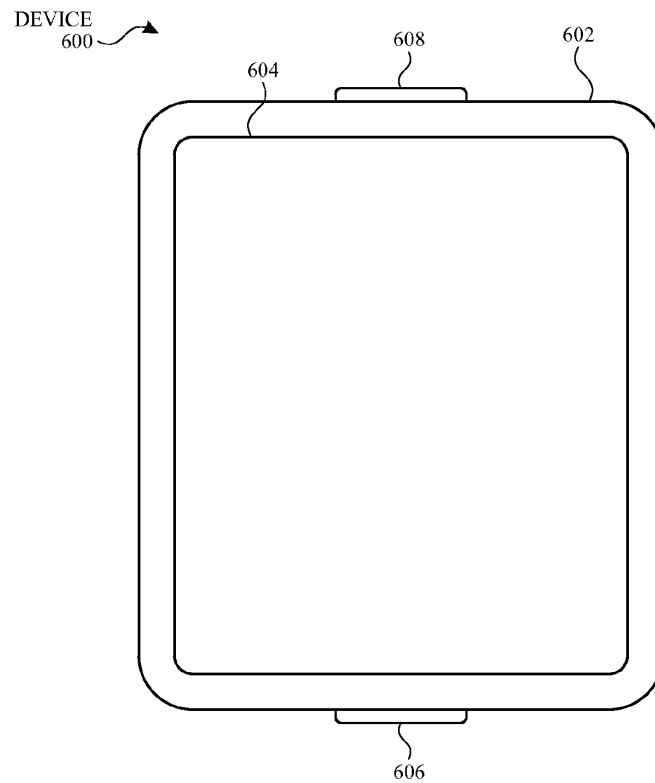


FIG. 5B

**FIG. 6A**

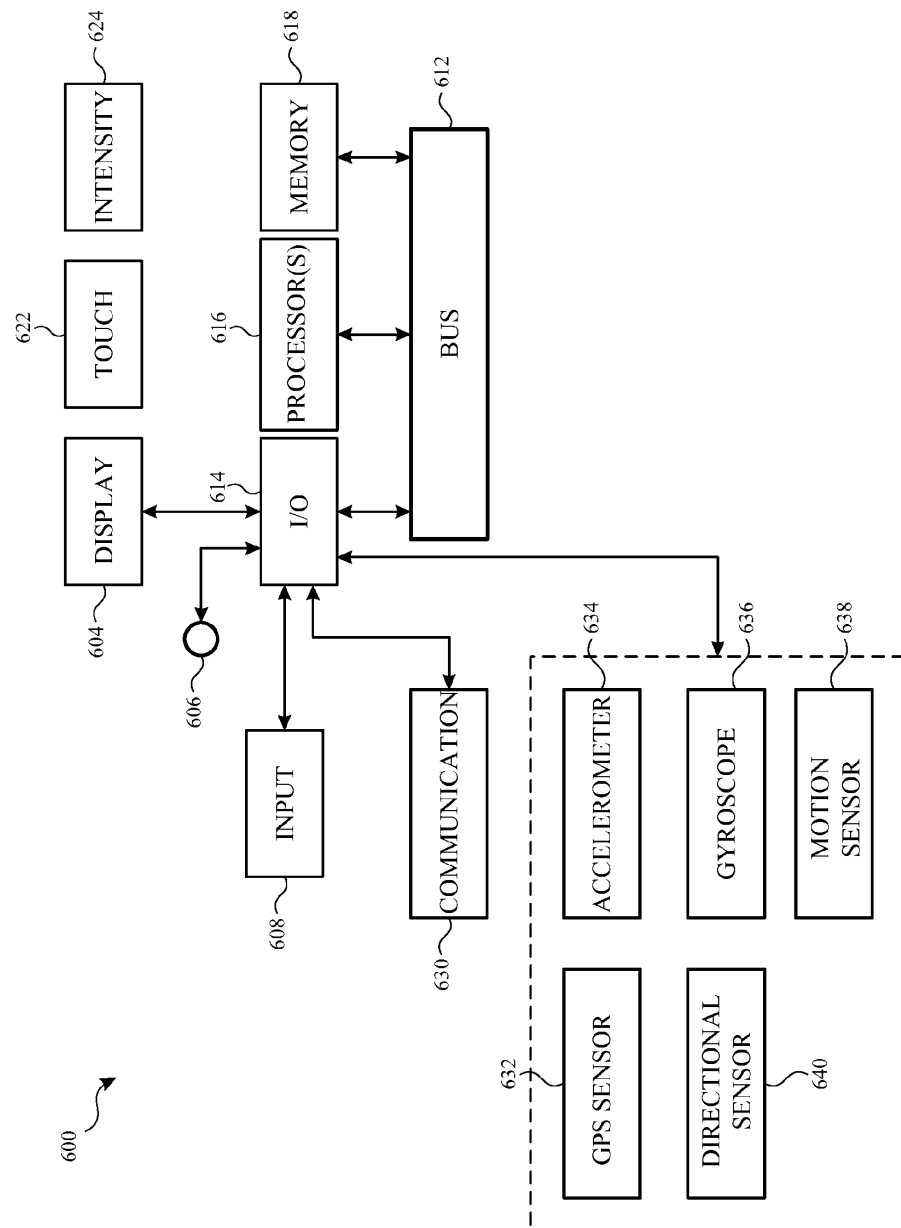


FIG. 6B

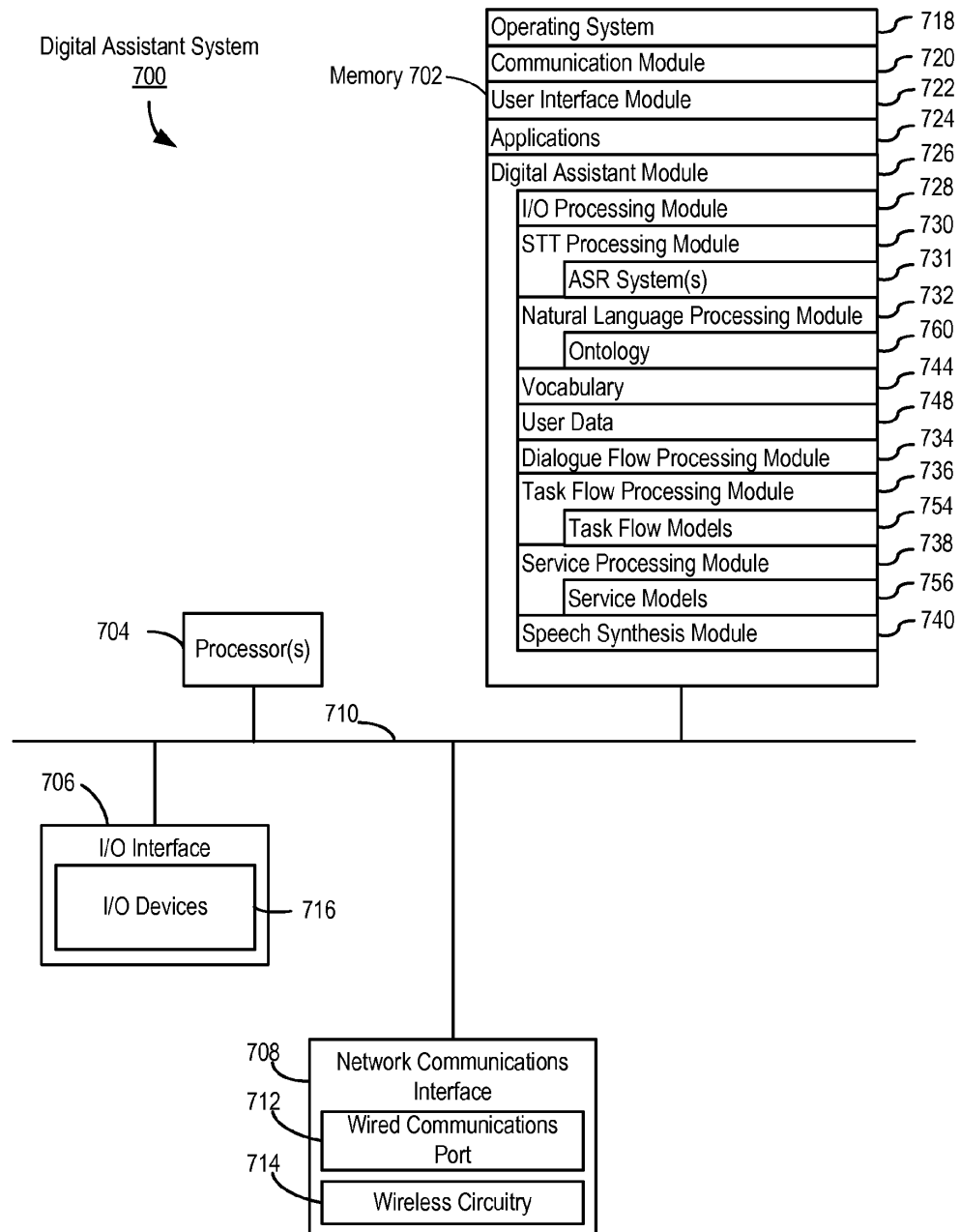


FIG. 7A

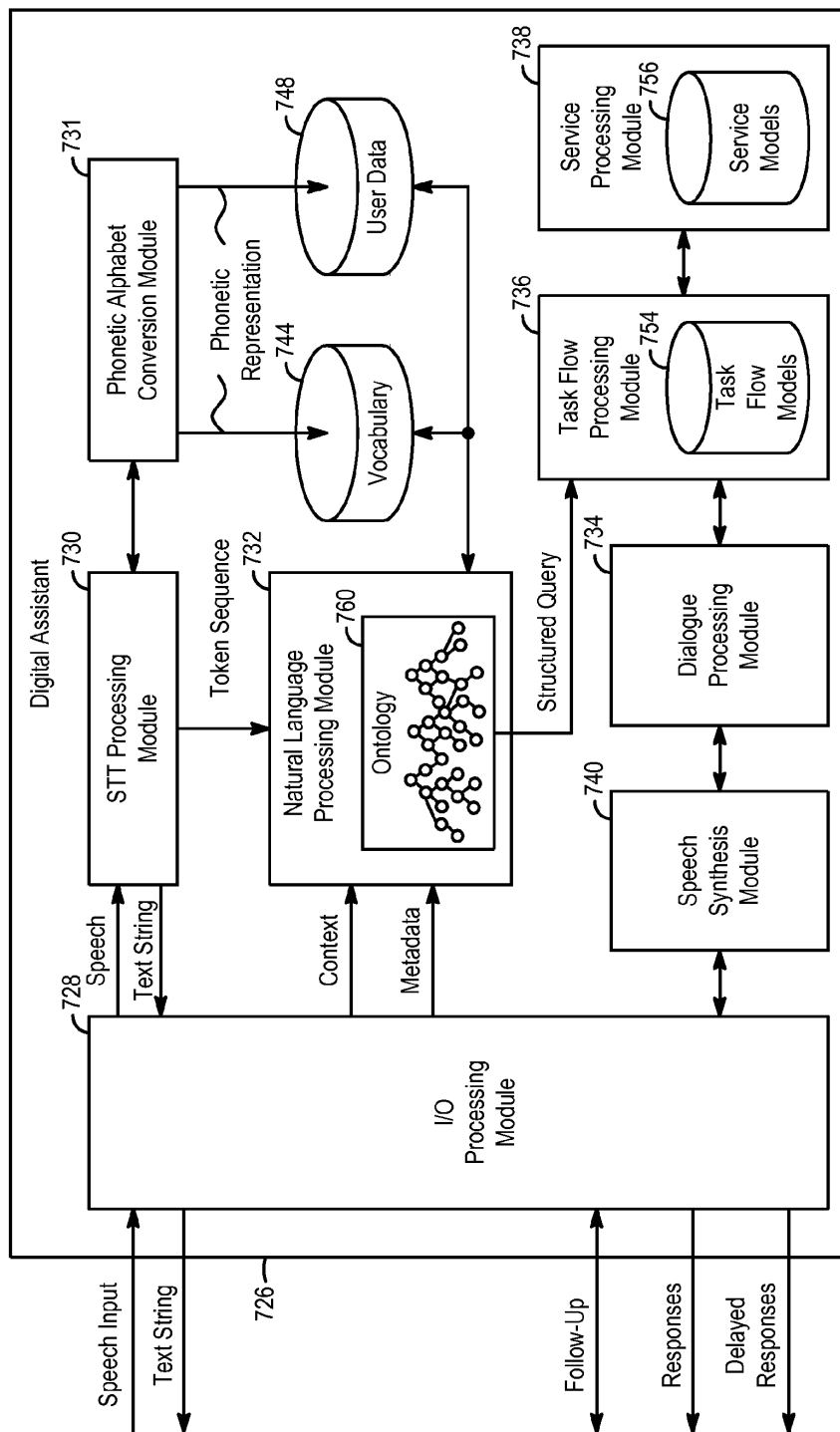


FIG. 7B

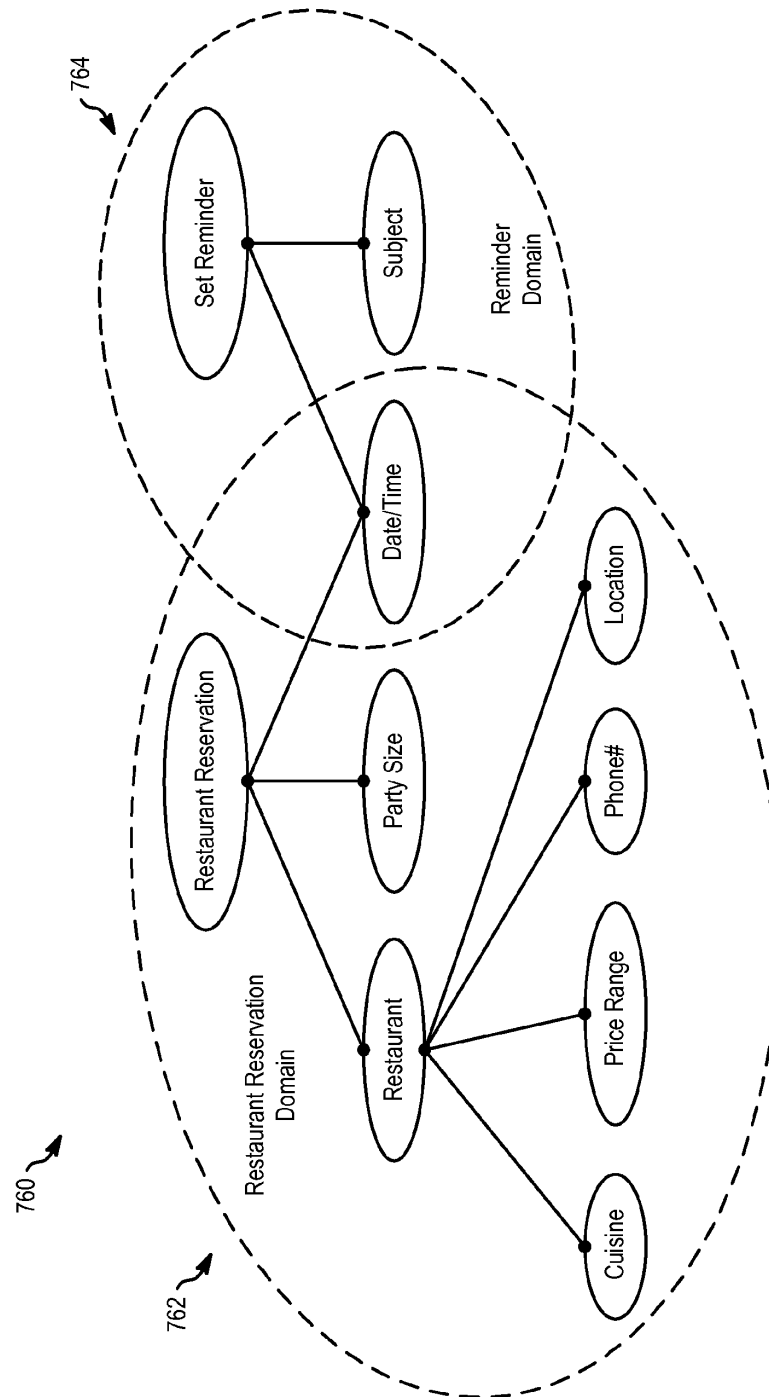


FIG. 7C

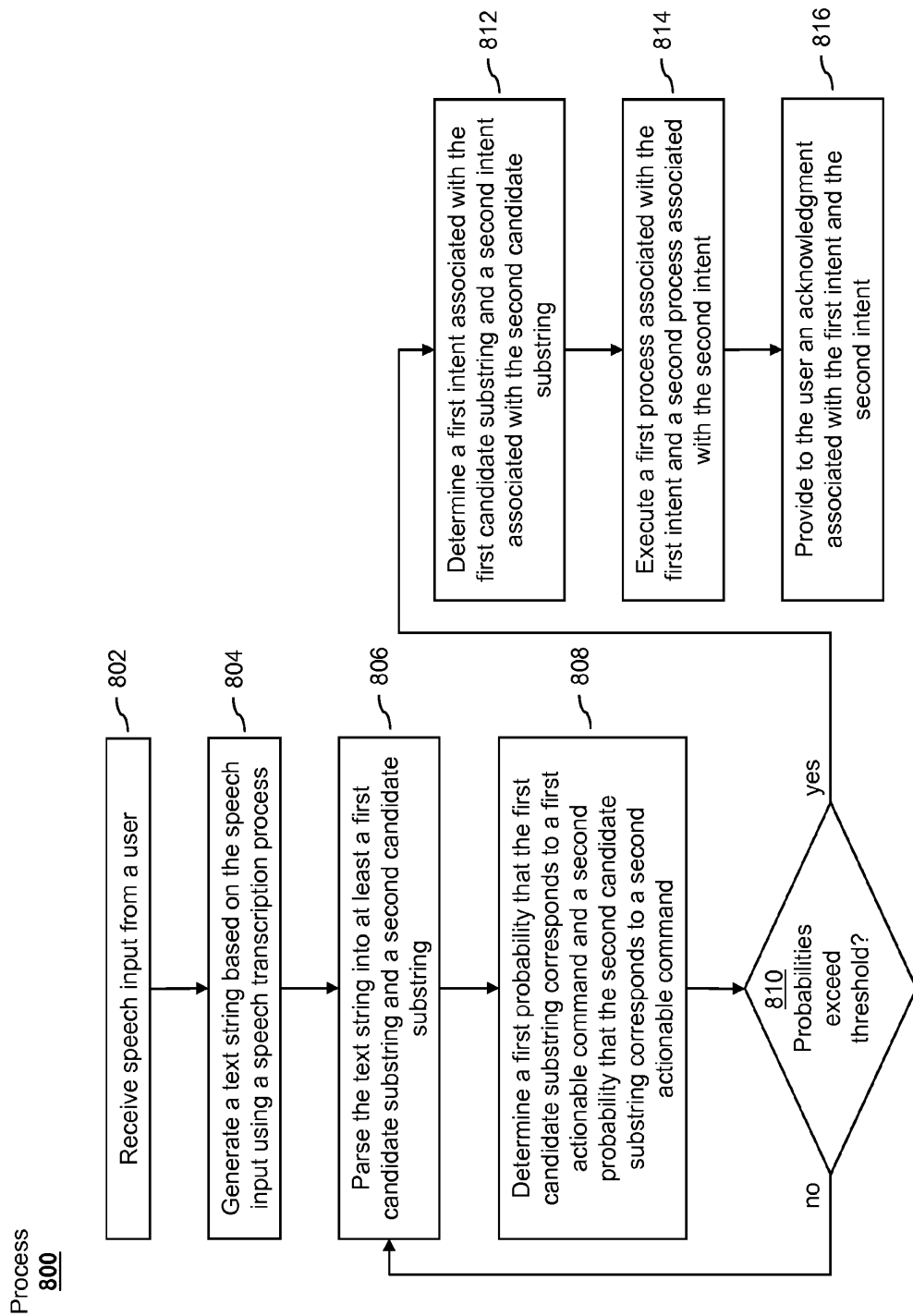


FIG. 8

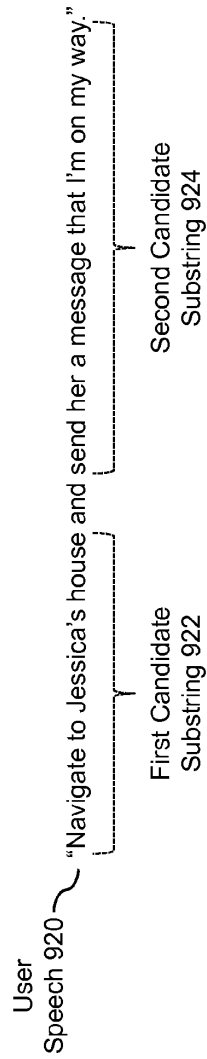


FIG. 9

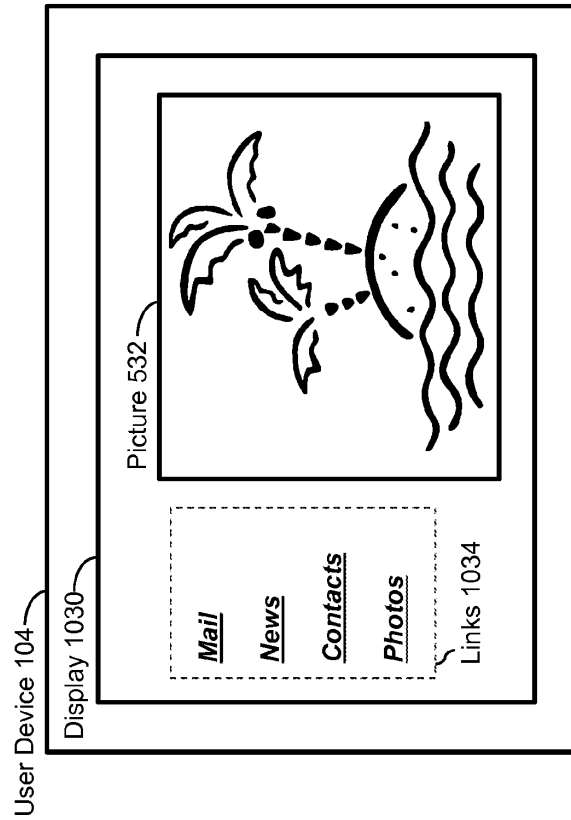


FIG. 10

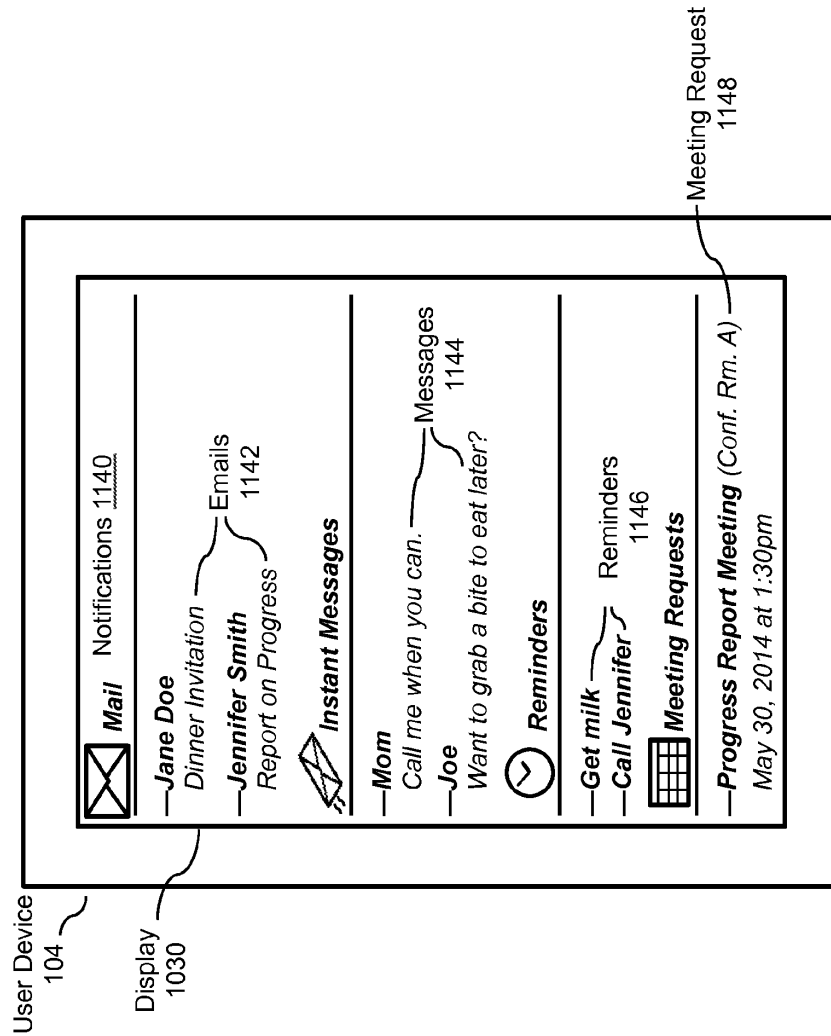


FIG. 11

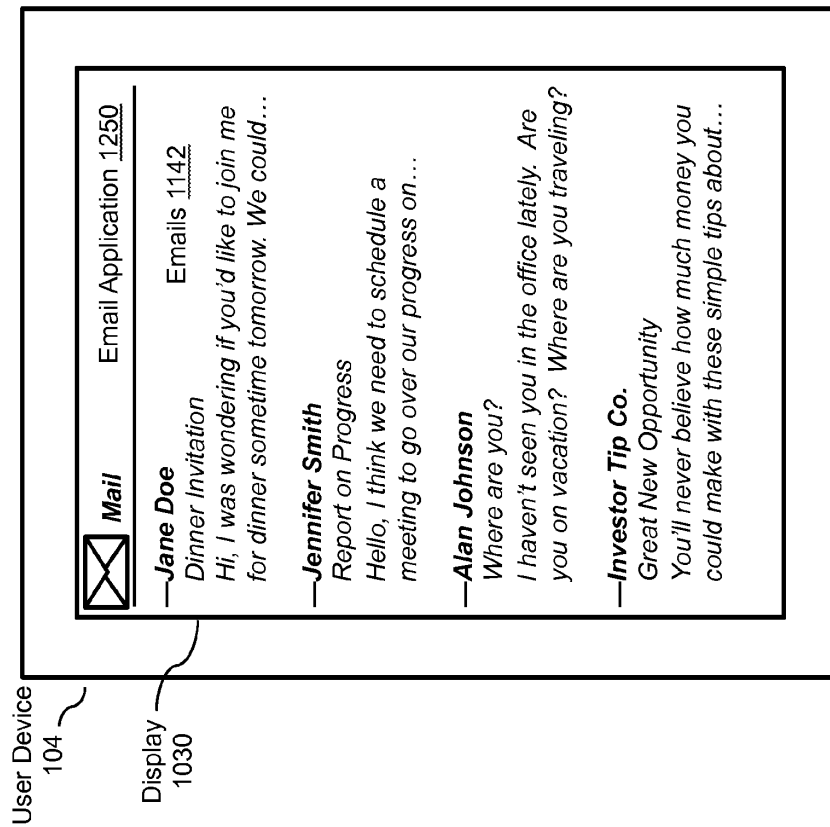


FIG. 12

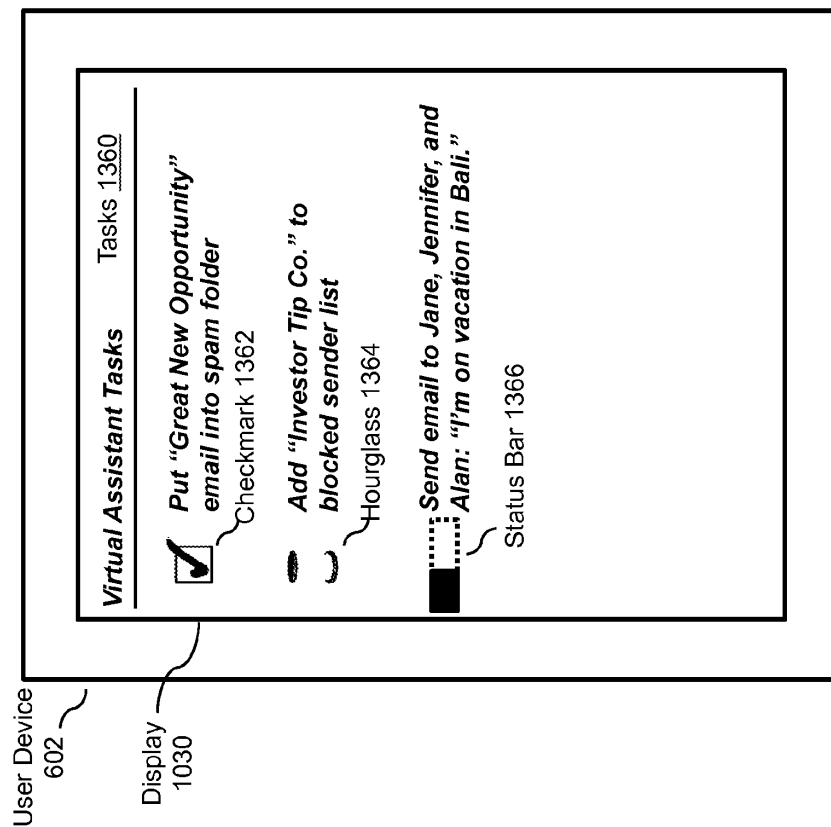


FIG. 13

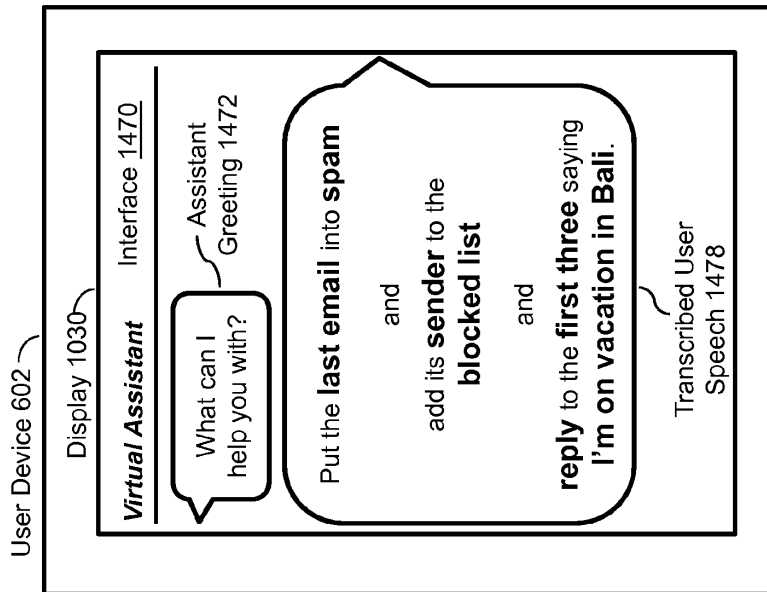


FIG. 14B

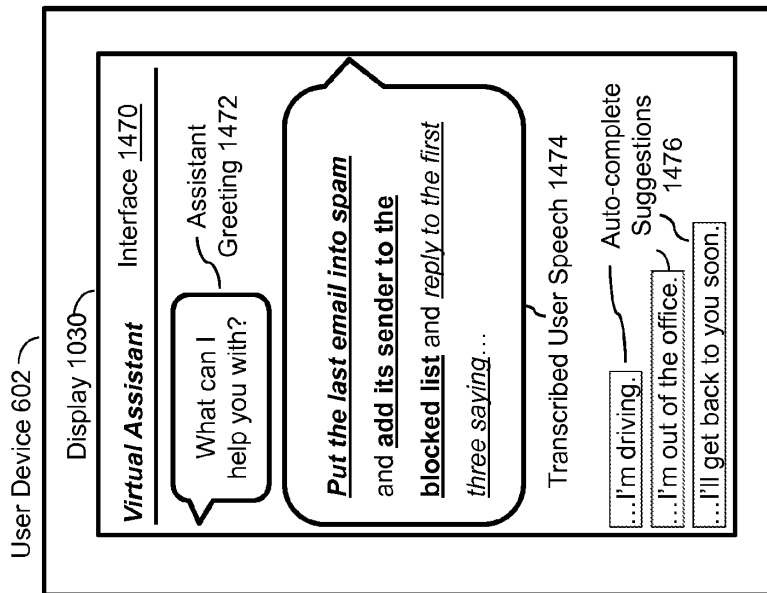
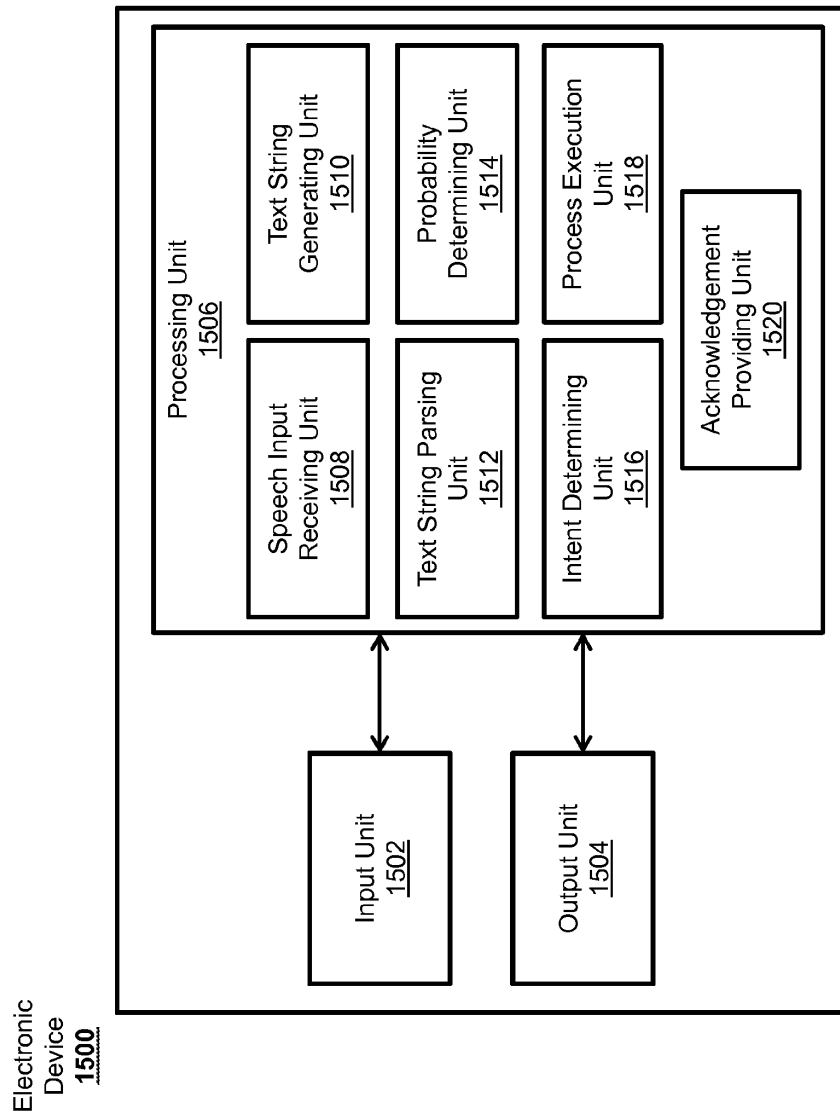


FIG. 14A

**FIG. 15**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/033051

A. CLASSIFICATION OF SUBJECT MATTER INV. G10L15/18 G10L15/26 G10L15/28 ADD. G10L15/08 G10L15/22		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) G10L		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YU ZHONG ET AL: "JustSpeak", 20140407; 20140407 - 20140407, 7 April 2014 (2014-04-07), pages 1-4, XP058048270, DOI: 10.1145/2596695.2596720 ISBN: 978-1-4503-2651-3	1-3, 5-33, 35-54
Y	figure 1 section "JUSTSPEAK"	4, 34
X	GB 2 343 285 A (IBM [US]) 3 May 2000 (2000-05-03)	1-3, 5-33, 35-54
Y	figures 1-3 page 1, lines 7-18 page 4, lines 12-14 page 5, line 17 - page 6, line 22 page 8, lines 33-46 ----- -/-	4, 34
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 28 July 2015		Date of mailing of the international search report 05/08/2015
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer: Tilp, Jan

Form PCT/ISA/210 (second sheet) (April 2005)

page 1 of 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/033051

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	US 2014/244258 A1 (SONG MINKYU [KR] ET AL) 28 August 2014 (2014-08-28)	1-3, 5-33, 35-54
Y,P	figures 3,5-8 paragraph [0022] paragraphs [0034] - [0084] -----	4,34
Y	IRYNA GUREVYCH ET AL: "Semantic Coherence Scoring Using an Ontology", NORTH AMERICAN CHAPTER OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS ARCHIVE. PROCEEDINGS OF THE 2003 CONFERENCE OF THE NORTH AMERICAN CHAPTER OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS ON HUMAN LANGUAGE TECHNOLOGY,, vol. 1, 27 May 2003 (2003-05-27), pages 9-16, XP007915465, DOI: 10.3115/1073445.1073457 section 2.1 -----	4,34

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/033051

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2343285	A	03-05-2000	CN 1252592 A	10-05-2000
			GB 2343285 A	03-05-2000
			JP 3476006 B2	10-12-2003
			JP 2000132186 A	12-05-2000
			US 2001056344 A1	27-12-2001

US 2014244258	A1	28-08-2014	KR 101383552 B1	10-04-2014
			US 2014244258 A1	28-08-2014
			WO 2014129856 A1	28-08-2014

Form PCT/ISA/210 (patent family annex) (April 2005)

PATENT TERM ADJUSTMENT STATEMENT UNDER 37 CFR 1.704(d)	Application Number	15/429,715	
	Confirmation Number	5067	
	Filing Date	February 10, 2017	
	First Named Inventor	Arunabha CHOUDHURY	
	Art Unit	2677	
	Examiner Name	RILEY, MARCUS T	
	Attorney Docket Number	Q231458	
APPLICANT HEREBY STATES THE FOLLOWING (please review 37 CFR 1.704(d) before filing this form): ☒ Each item of information contained in the information disclosure statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in 37 CFR 1.56(c) more than thirty days prior to the filing of the information disclosure statement. AND/OR ☒ Each item of information contained in the information disclosure statement is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in 37 CFR 1.56(c) more than thirty days prior to the filing of the information disclosure statement.			
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<p style="text-align: center;">WASHINGTON OFFICE 23373 CUSTOMER NUMBER</p>			
Signature	/Christopher R. Lipp/	Date	February 13, 2019
Typed or Printed Name	Christopher R. Lipp	Registration Number	41,157
Note: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required in accordance with 37 CFR 1.33 and 11.18. Please see 37 CFR 1.4(d) for the form of the signature. If necessary, submit multiple forms for more than one signature, see below*.			
☒	*Total of <u>1</u> forms are submitted.		



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
15/429,715	02/10/2017	2677	1600	Q231458	20	3

CONFIRMATION NO. 5067
CORRECTED FILING RECEIPT



23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

Date Mailed: 02/07/2019

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Inventor(s)

Arunabha CHOUDHURY, Bangalore, INDIA;
Sriram NAGASWAMY, Bangalore, INDIA;

Applicant(s)

SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF;

Assignment For Published Patent Application

SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF

Power of Attorney: The patent practitioners associated with Customer Number 23373

Domestic Applications for which benefit is claimed - None.

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INDIA 201641004997 02/12/2016 No Access Code Provided

INDIA 2016 41004997 12/05/2016 No Access Code Provided

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/429,715**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
Title

METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

Preliminary Class

704

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2677

Confirmation No.: 5067

Examiner: RILEY, MARCUS T

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

REQUEST FOR CORRECTED OFFICIAL FILING RECEIPT

ATTN:Office of Initial Patent Examination

Filing Receipt Correction

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

We enclose a copy of the Official Filing Receipt for the above-identified application and
request the following corrections:

Foreign Applications:

INDIA 201641004997 02/12/2016

INDIA 201641004997 02/12/2016

INDIA 201641004997 12/05/2016

Verification for the requested corrections is indicated on the Application Data Sheet filed
February 10, 2017.

Respectfully submitted,

/Christopher R. Lipp/

Christopher R. Lipp

Registration No. 41,157

SUGHRUE MION, PLLC

Telephone: 202.293.7060

Facsimile: 202.293.7860

WASHINGTON OFFICE

233734

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Date: February 4, 2019



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
15/429,715	02/10/2017	2658	1600	Q231458	20	3

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Sriram NAGASWAMY, Bangalore, INDIA;

Applicant(s)

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Assignment For Published Patent Application

SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF

Power of Attorney: The patent practitioners associated with Customer Number 23373

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INDIA 201641004997 02/12/2016
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Projected Publication Date: 08/17/2017

Non-Publication Request: No

Early Publication Request: No

Title

METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

Preliminary Class

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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Electronic Acknowledgement Receipt	
EFS ID:	35043525
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Christopher Robert Lipp/Todd Yarborough
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	04-FEB-2019
Filing Date:	10-FEB-2017
Time Stamp:	10:45:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Corrected Filing Receipt	Q231458RCOFAsfiled.pdf	561802 70b4b95fc36c9601b7f96ce363fb6b9f1dd262dc	no	4
Warnings:					

Information:	
Total Files Size (in bytes):	561802
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>	



UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

23373 7590 01/10/2019
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER

RILEY, MARCUS T

ART UNIT

PAPER NUMBER

2677

DATE MAILED: 01/10/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067

TITLE OF INVENTION: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	04/10/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23373 7590 01/10/2019
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067

TITLE OF INVENTION: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0.00	\$0.00	\$1000	04/10/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
RILEY, MARCUS T	2677	704-244000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

- ☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067
23373 7590 01/10/2019 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER RILEY, MARCUS T	
			ART UNIT 2677	PAPER NUMBER

DATE MAILED: 01/10/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b) (2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/429,715	Applicant(s) CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	AIA Status Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Request for Continued Examination (RCE) filed 12/31/2018.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-5,7-14,16-19 and 21-23. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov**.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:
a) ☒ All b) ☐ Some *c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 31, 2018 has been entered.

Response to Amendment

1. This office action is responsive to the applicant's remarks received December 3, 2018. **Claims 1-5, 7-14, 16-19 & 21-23** have been fully considered and are persuasive. **Claims 6, 15 & 20** have been cancelled.

Response to Arguments

2. Applicant's arguments with respect to the amended claims have been fully considered and are persuasive.

Claim Rejections

3. In light of the amendments presented, Examiner withdraws the 35 USC § 103 rejection of **Claims 1-5, 7-14, 16-19 & 21-23**. In view of “*Applicant Arguments/Remarks Made in an Amendment*” filed December 31, 2018. **Claims 1-5, 7-14, 16-19 & 21-23** are now considered to be allowable subject matter.

Claim Interpretations - 35 USC § 112(f)

(The previous claim interpretations are taken in consideration of applicant’s amendments.)

Allowable Subject Matter

4. **Claims 1-5, 7-14, 16-19 & 21-23** are allowed.

5. The following is Examiners statement of reasons for allowance:

Claim 1-5, 7-14, 16-19 & 21-23 uniquely identify the distinct features a method and electronic device for performing voice based actions.

The closest prior art made of record is Brown et al. (US 20140317502 A1), Simpson (US 20040054539 A1) and Mauro et al. (US 20140258324 A1).

The cited reference (Brown) teaches wherein conversation user interfaces that are configured for virtual assistant interaction may include contextual interface items that are based on contextual information. The contextual information may relate to a current or previous conversation between a user and a virtual assistant and/or may relate to other types of information,

such as a location of a user, an orientation of a device, missing information, and so on. The conversation user interfaces may additionally, or alternatively, control an input mode based on contextual information, such as an inferred input mode of a user or a location of a user. Further, the conversation user interfaces may tag conversation items by saving the conversation items to a tray and/or associating the conversation items with indicators.

The cited reference (Simpson) teaches wherein a voice control application transmits data to a voice server about a first execution state of an application program resident in the memory of an electronic device having a first graphical display. The voice control application also transmits an audio waveform encoding of a voice command defining a second execution state of the application program. The voice server performs a speech recognition process upon the audio waveform encoding and transmits a reply to the electronic device for causing the second execution state of the application program. The voice control program, in response to the response, automatically causes the second execution state of the application program having a second graphical display.

The cited reference (Mauro) teaches a method of providing a task assistant. The task assistant is designed to receive input from a user through multimodal input including a plurality of speech input, typing input, and touch input, determine the meaning of the input, and determining whether there is a context based on prior interactions with the user. The method further to generate an interpreted input based on a combination of the input and the context, and providing a formatted query to an application. The method further to receive data from the application in response to the formatted query, and provide a response to the user through multimodal output including a plurality of: speech output, text output, non-speech audio output, haptic output, and visual non-text output. The method further to update the context based on the interpreted input.

The cited reference (Brown, Simpson and Mauro) fails to disclose based on determining that there is the relationship between the, first voice command and the context of the at least one historic voice command associated with the first application, performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command associated with the receiving, by the electronic device, a second voice command associated with a second application different from the first application; determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, performing, by the electronic device, at least one second action by executing the second voice command with respect to the second application based on the context of the at least one historic voice command associated with the first application. As a result and for these reasons, Examiner indicates **Claims 1-5, 7-14, 16-19 & 21-23** as allowable subject matter.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue and fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS T. RILEY, ESQ. whose telephone number is (571)270-1581. The examiner can normally be reached on 9-5 M-F.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tammy P. Goddard can be reached on 517-272-7773. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MARCUS T RILEY/
Primary Examiner, Art Unit 2677

<i>Notice of References Cited</i>	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	Page 1 of 2

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*	B	US-20140317502-A1	10-2014	Brown; Fred A.	G06F9/453	715/706
*	C	US-20140258324-A1	09-2014	Mauro; David Andrew	G06F17/30392	707/766
*	D	US-20040054539-A1	03-2004	Simpson, Nigel D.	G10L15/30	704/270.1
*	E	US-20150003595-A1	01-2015	Yaghi; Mudar	G06Q10/063	379/85
*	F	US-9070366-B1	06-2015	Mathias; Lambert	G06F17/279	1/1
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*	H	US-8958848-B2	02-2015	Shin; Jong-Ho	H04M1/72583	455/563
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*	K	US-20100169098-A1	07-2010	Patch; Kimberly		704/275
*	L	US-20150348547-A1	12-2015	PAULIK; Matthias	G10L15/19	704/251
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	N					
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	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

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Part of Paper No. 20190104

<i>Notice of References Cited</i>	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	Page 2 of 2

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*	B	US-20080103781-A1	05-2008	Wasson; Ryan J.	G10L15/22	704/277
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*	D	US-8315878-B1	11-2012	Burns; Stephen S.	G10L15/22	704/231
	E					
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
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	S					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20190104

Issue Classification 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	

CPC						
Symbol					Type	Version
G10L	/	15	/	22	F	2013-01-01
G10L	/	15	/	063	I	2013-01-01
G10L	/	15	/	1815	I	2013-01-01
G10L	/	15	/	1822	I	2013-01-01
G10L	/	2015	/	0635	A	2013-01-01
G10L	/	2015	/	223	A	2013-01-01
G10L	/	2015	/	228	A	2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/				

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	04 January 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	10	7

U.S. Patent and Trademark Office

Part of Paper No.: 20190104

Issue Classification 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G10L	/	15	/ 06
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
704	244

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
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NONE		Total Claims Allowed:	
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(Primary Examiner)	(Date)	10	7

U.S. Patent and Trademark Office

Part of Paper No.: 20190104

Issue Classification 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
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8	9	16	18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/MARCUS T RILEY/ Primary Examiner, Art Unit 2677 (Primary Examiner) _____ (Date) 04 January 2019		O.G. Print Claim(s) 10	O.G. Print Figure 7

U.S. Patent and Trademark Office

Part of Paper No.: 20190104

<i>Search Notes</i> 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677

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US Classification - Searched*			
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/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	/K.H./ Examiner, Art Unit 2677
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<i>Search Notes</i> 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Consulted SPE Tammy Pham	03/30/2018	KH
STIC Plus Search	9/27/2018	MTR
Google Patents - Search Terms (Electronic, Device, Voice, Command, Actions, Execute)	9/27/2018	MTR
IP.com - Search Terms (Electronic, Device, Voice, Command, Actions, Execute)	9/27/2018	MTR
(704/244) Text Search Only - See Search History Printout	9/27/2018	MTR
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/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	/K.H./ Examiner, Art Unit 2677
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<i>Search Notes</i> 	Application/Control No. 15/429,715	Applicant(s)/Patent Under Reexamination CHOUDHURY et al.
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677

Interference Search			
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G10L015	(06, 18, 22) Text Search Only - See Search History Printout	01/04/2019	MTR
G10L2015	(0635, 223, 228) Text Search Only - See Search History Printout	01/04/2019	MTR

/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	/K.H./ Examiner, Art Unit 2677
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EAST Search History

EAST Search History (Prior Art)

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S64	1697	S63 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and (voic\$4 and mobil\$4) and (histor\$8 and stor\$4) and (audio\$4 and microphon\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:55
S65	1089	S64 and (voic\$8 near5 command\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:55
S66	897	S65 and (application\$8 and context\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:56
S67	786	S66 and (voic\$8 adj command\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:56
S68	140	S67 and (histor\$8 near5 command\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:57
S69	49	S68 and (histor\$8 near5 voic\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:57
S70	27	S69 and (electronic\$4 adj devic\$4)	US- PGPUB; USPAT	OR	OFF	2019/01/04 18:58

EAST Search History (I nterference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S71	113	704/244	US- PGPUB	OR	OFF	2019/01/04 18:48
S72	238	704/243	US- PGPUB	OR	OFF	2019/01/04 18:48
S73	6867	(G10L15/06 G10L15/18 G10L15/22 G10L15/063 G10L15/1815 G10L15/1822 G10L015/06 G10L015/18 G10L015/22 G10L2015/0635 G10L2015/223 G10L2015/228).cpc.	US- PGPUB	OR	OFF	2019/01/04 18:48
S74	22598	704/1-504.ccls.	US-	OR	OFF	2019/01/04

			PGPUB			18:48
S75	579	choudhury.in.	US-PGPUB	OR	OFF	2019/01/04 18:49
S76	13	nagaswamy.in.	US-PGPUB	OR	OFF	2019/01/04 18:49
S77	26614	S71 S72 S73 S74 S75 S76	US-PGPUB	OR	OFF	2019/01/04 18:51
S78	0	S77 and (electronic\$4 and devic\$4).clm. and (application\$4 and command\$4).clm. and (voic\$4 and mobil\$4).clm. and (histor\$8 and stor\$4).clm. and (audio\$4 and microphon\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:52
S79	147	S77 and (electronic\$4 and devic\$4).clm. and (application\$4 and command\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:52
S80	28	S79 and (voic\$4 and mobil\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:53
S81	1	S80 and (histor\$8 and stor\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:53
S82	11	S80 and (audio\$4 and microphon\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:53
S83	0	S82 and (histor\$8 and stor\$4).clm.	US-PGPUB	OR	OFF	2019/01/04 18:53
S84	145586	"s12" "s13" "s14" "s15" "s16"	US-PGPUB	OR	OFF	2019/01/04 18:54

1/ 4/ 2019 7:01:41 PM

C:\Users\mriley\Documents\EAST\Workspaces\15429715.wsp

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL							
Application Number	15/429,715	Filing Date	February 10, 2017	Confirmation Number	5067	Docket Number	Q231458
First Named Inventor	Arunabha CHOUDHURY		Examiner Name	RILEY, MARCUS T		Art Unit	2677
Title	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS						
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.							
SUBMISSION REQUIRED UNDER 37 CFR 1.114							
<small>Note: If the RCE is proper, any previously filed unentered amendments and amendments attached with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).</small>							
☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked. <div style="margin-left: 20px;"> ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____ ☒ Other Amendment Under 37 C.F.R. § 1.116 filed December 3, 2018 </div> ☐ Do NOT consider the amendment(s)/reply under 37 CFR 1.116 previously filed on _____ ☐ Attached <div style="margin-left: 20px;"> ☐ Amendment/Reply ☐ Information Disclosure Statement (IDS) ☐ Affidavit(s)/Declaration(s) ☒ Other <u>Statement of Substance of Interview</u> </div>							
MISCELLANEOUS							
☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required) ☐ Other _____							
FEES							
The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. ☒ Payment by credit card. ☒ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.							
CORRESPONDENCE ADDRESS							
<i>Direct all correspondence to the address for SUGHRUE MION, PLLC filed under the Customer Number listed below:</i> <small>WASHINGTON OFFICE</small> 23373 <small>CUSTOMER NUMBER</small>							
SIGNATURE OF REGISTERED U.S. PATENT PRACTITIONER							
Signature <u>/ Marina V. Zalevsky /</u>				Date <u>December 31, 2018</u>			
Name <u>Marina V. Zalevsky</u>				Registration No. <u>53,825</u>			

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2677

Confirmation No.: 5067

Examiner: RILEY, MARCUS T

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

STATEMENT OF SUBSTANCE OF INTERVIEW

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

Sir:

REMARKS

Please review and enter the following remarks summarizing the interview conducted
December 12, 2018:

During the interview, the claimed invention and the outstanding rejections were
discussed. It was argued that the amended claims, as submitted in the Amendment filed
December 3, 2018, are patentable over the cited references.

The Examiner stated that the amended claims would require further search and/or
consideration to determine patentability.

It is respectfully submitted that the instant STATEMENT OF SUBSTANCE OF
INTERVIEW complies with the requirements of 37 C.F.R. §§1.2 and 1.133 and MPEP §713.04.

It is believed that no petition or fee is required. However, if the USPTO deems
otherwise, Applicant hereby petitions for any extension of time which may be required to

STATEMENT OF SUBSTANCE OF INTERVIEW
Appln. No.: 15/429,715

Attorney Docket No.: Q231458

maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

/ Marina V. Zalevsky /

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

Marina V. Zalevsky
Registration No. 53,825

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: December 31, 2018

Electronic Patent Application Fee Transmittal				
Application Number:		15429715		
Filing Date:		10-Feb-2017		
Title of Invention:		METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
First Named Inventor/Applicant Name:		Arunabha CHOUDHURY		
Filer:		Marina V. Zalevsky/Evelyn Jacob		
Attorney Docket Number:		Q231458		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
Total in USD (\$)				1300

Electronic Acknowledgement Receipt	
EFS ID:	34727447
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Marina V. Zalevsky/Evelyn Jacob
Filer Authorized By:	Marina V. Zalevsky
Attorney Docket Number:	Q231458
Receipt Date:	31-DEC-2018
Filing Date:	10-FEB-2017
Time Stamp:	14:15:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1300
RAM confirmation Number	010219INTEFSW14170900
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	Q231458RCE.pdf	34188	no	1
			b386fc42f5eca8a1432f551bc3ee41361447bd70		
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Applicant summary of interview with examiner	Q231458SSI.pdf	25304	no	2
			9875f4547c3e45b51f5c3044224baaf18424d131		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30622	no	2
			3e94b1676451a76454c9a6dfec20eae02c56a61		
Warnings:					
Information:					
Total Files Size (in bytes):			90114		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067
23373	7590	12/18/2018	EXAMINER	
SUGHRUE MION, PLLC			RILEY, MARCUS T	
2100 PENNSYLVANIA AVENUE, N.W.			ART UNIT	
SUITE 800			PAPER NUMBER	
WASHINGTON, DC 20037			2677	
			NOTIFICATION DATE	
			DELIVERY MODE	
			12/18/2018	
			ELECTRONIC	

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
USPTO@sughrue.com
sughrue@sughrue.com

Advisory Action Before the Filing of an Appeal Brief	Application No. 15/429,715	Applicant(s) CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	AIA Status Yes

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

THE REPLY FILED 03 December 2018 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires _____ months from the mailing date of the prior Advisory Action or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANTS FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because:

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: See Continuation Sheet (See 37CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicants reply has overcome the following rejection(s): _____

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:
 See Continuation Sheet.

13. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____

14. ☒ Other: See Continuation Sheet.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
 Claim(s) allowed: _____
 Claim(s) objected to: _____
 Claim(s) rejected: 1-5,7-14,16-19 and 21-23.
 Claim(s) withdrawn from consideration: _____

/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	
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Continuation of 3: Applicant submits amended independent claims with the newly added limitation to specify based on determining that there is the relationship between the first voice command and a context of the at least one historic voice command associated with the first application, performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command associated with the first application; and receiving, by the electronic device, a second voice command associated with a second application different from the first application; determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, performing, by the electronic device, at least one second action by executing the second voice command with respect to the second application based on the context of the at least one historic voice command associated with the first application.

Continuation of 12: Examiner submits that Claims 1-5, 7-14, 16-19 and 21-23 does not place the application in condition for allowance because it relies on the newly added claim limitation not being entered and the finally rejected claims do not overcome the prior art of record. In addition, it would require further consideration including but not limited to more than the allotted time to make a decision on the Application and conduct a thorough and proper search.

Attached: PTOL-2323, PTO-413

<i>Applicant-Initiated Interview Summary</i>	Application No. 15/429,715	Applicant(s) CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	AIA Status Yes

All participants (applicant, applicants representative, PTO personnel):

(1) MARCUS T. RILEY, ESQ. (3) ____.

(2) Marina V. Zalevsky (Reg. 53,825) .. (4) ____.

Date of Interview: 12 December 2018.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: ____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1-5,7-14,16-19 and 21-23.

Identification of prior art discussed: See Continuation Sheet.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Applicant's representative presented his position on the claimed invention. Ways to overcome the prior art were discussed and the examiner will formally consider the proposed position of the applicant by updating the search and taking a more in-depth look at the prior art..

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/MARCUS T RILEY/ Primary Examiner, Art Unit 2677	
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Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Continuation of Identification of prior art discussed: Brown et al. (US 20140317502 A1), Simpson (US 20040054539 A1) and Mauro et al. (US 20140258324 A1)

Attached: PTOL-2323, PTO-303

<h2 style="margin: 0;">AFCP 2.0 Decision</h2>	Application No. 15/429,715	Applicant(s) CHOUDHURY et al.	
	Examiner MARCUS T RILEY, ESQ.	Art Unit 2677	AIA Status Yes

This is in response to the After Final Consideration Pilot request filed 03 December 2018.

1. Improper Request – The AFCP 2.0 request is improper for the following reason(s) and the after final amendment submitted with the request will be treated under pre-pilot procedure.

☐ An AFCP 2.0 request form PTO/SB/434 (or equivalent document) was not submitted.
☐ A non-broadening amendment to at least one independent claim was not submitted.
☐ A proper AFCP 2.0 request was submitted in response to the most recent final rejection.
☐ Other: _____

2. Proper Request

A. After final amendment submitted with the request will not be treated under AFCP 2.0.
 The after final amendment cannot be reviewed and a search conducted within the guidelines of the pilot program.
☐ The after final amendment will be treated under pre-pilot procedure.

B. Updated search and/or completed additional consideration.
 The examiner performed an updated search and/or completed additional consideration of the after final amendment within the time authorized for the pilot program. The result(s) of the updated search and/or completed additional consideration are:

☐ 1. All of the rejections in the most recent final Office action are overcome and a Notice of Allowance is issued herewith.
☐ 2. The after final amendment would not overcome all of the rejections in the most recent final Office action . See attached interview summary for further details.
☒ 3. The after final amendment was reviewed, and it raises a new issue(s). See attached interview summary for further details.
☐ 4. The after final amendment raises new issues, but would overcome all of the rejections in the most recent final Office action. A decision on determining allowability could not be made within the guidelines of the pilot. See attached interview summary for further details, including any newly discovered prior art.
☐ 5. Other: _____

Examiner Note: Please attach an interview summary when necessary as described above.

Attached: PTO-303, PTO-413

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0			
Practitioner Docket No.:	Q231458	Application No.:	15/429,715
First Named Inventor:	Arunabha CHOUDHURY	Filing Date:	February 10, 2017
Title:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.			
<ol style="list-style-type: none"> 1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (<i>e.g.</i>, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c). 2. The above-identified application contains an outstanding final rejection. 3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect. 4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection. 5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response. 6. This certification and request is being filed electronically using the Office's electronic filing system (EFS-Web). 7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, <i>e.g.</i>, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.] 8. By filing this certification and request, applicant acknowledges the following: <ul style="list-style-type: none"> • Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0. • The examiner will verify that the AFCP 2.0 submission is compliant, <i>i.e.</i>, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions: <ul style="list-style-type: none"> ○ The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, <i>e.g.</i>, by mailing an advisory action. ○ If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview. <ul style="list-style-type: none"> • The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate. • If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116. 			
Signature / Marina V. Zalevsky /		Date December 3, 2018	
Name Marina V. Zalevsky		Practitioner Reg No. 53,825	
Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.			
☒ *Total of <u> 1 </u> forms are submitted.			

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2677

Confirmation No.: 5067

Examiner: HARRIS, KEARA S

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

AMENDMENT UNDER 37 C.F.R. § 1.116

MAIL STOP AF

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated October 2, 2018, please amend the above-
identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS	2
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Electronic Acknowledgement Receipt	
EFS ID:	34468487
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Marina V. Zalevsky/Evelyn Jacob
Filer Authorized By:	Marina V. Zalevsky
Attorney Docket Number:	Q231458
Receipt Date:	03-DEC-2018
Filing Date:	10-FEB-2017
Time Stamp:	16:23:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	After Final Consideration Program Request	Q231458AFCP.pdf	44896	no	1
			081c02a13bf395225a184bcb6cbb9a9a481d75d069		
Warnings:					

Information:					
2		Q231458Amendment116.pdf	66704	yes	16
			33f6a0ab8810d35d0bf9f8968c40f06d4dcc433		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Response After Final Action		1	1	
	Claims		2	8	
	Applicant Arguments/Remarks Made in an Amendment		9	16	
Warnings:					
Information:					
Total Files Size (in bytes):			111600		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

REMARKS

I. Application Status

Claims 1-5, 7-19, and 21-23 are all the claims pending in the application. By this Amendment, claims 1, 2, 7, 8, 10, 11, 14, 16, 17, and 19 are amended. No new matter is added.

A Request for the After Final Consideration Pilot (AFCP 2.0) is being filed concurrently herewith, in which the Examiner is provided additional time to consider and enter the amendment and conduct interview with Applicant.

Reconsideration and allowance of the claims are respectfully requested.

II. Claim Interpretation Under 35 U.S.C. § 112(f)

Claims 10, 11, 14, 16, and 17 are interpreted under 35 U.S.C. § 112(f).

Without any admissions, claims 10, 11, 14, 16, and 17 are amended to recite a microprocessor and, thus, recite a sufficient structure to perform the claimed functions. Accordingly, withdrawal of the claim interpretation under § 112(f) is respectfully requested.

III. Rejections Under 35 U.S.C. § 103

Claims 1, 3-5, 7-10, 12-14, 16-19, and 21-23 are rejected under 35 U.S.C. § 103 as being unpatentable over Brown (US 2014/0317502) in view of Simpson (US 2004/0054539).

Claims 2 and 11 are rejected under 35 U.S.C. § 103 as being unpatentable over Brown in view of Simpson and Mauro (US 2014/0258324).

Applicant respectfully traverses the rejections.

Independent claim 10 recites among other features:

an audio receiver configured to receive a first voice command associated with a first application; and

at least one microprocessor configured to:

determine a relationship between the first voice command and a context of at least one historic voice command associated with the first application,

based on determining that there is the relationship between the first voice command and the context of the at least one historic voice command associated with the first application, perform at least one first action by executing the first voice command based on the context of the at least one historic voice command associated with the first application,

wherein the audio receiver is further configured to:

receive a second voice command associated with a second application different from the first application, and

wherein the at least one microprocessor is further configured to:

determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application, and

based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, perform at least one second action by executing the second voice command with respect to the second application based on the context of the at least one historic voice command associated with the first application.

With regard to claim 10, the Examiner asserts that Brown describes to determine a relationship between the first voice command and a context of historic voice command associated with the first application (the conversation user interface displays interface items that are based on contextual information, e.g., conversation history; paragraph 20), perform a first action by executing the first voice command based on the context of the voice command (FIG. 13; at 1308, the task may be performed based on the user input; paragraph 121); wherein the audio receiver is further configured to: receive a second voice command (FIG. 9; at time t2, the conversation user interface 900 is presented again with the text input field 904 and the microphone icon 906 enabled to receive text and/or speech input and the user 104 selects the

microphone icon 906 to provide speech input; paragraph 98), and wherein the processor is further configured to: determine a relationship between the second voice command and the context of the historic voice command associated with the first application (the conversation user interface displays interface items based on contextual information, e.g., conversation history. The conversation user interface 900 may adapt the input mode of the interface 900 based on contextual information, e.g., input history indicating one or more input modes that the user 104 has previously used to interact with the conversation user interface 900; paragraphs 20 and 99); and perform a second action by executing the second voice command on the second application based on the context of the historic voice command associated with the first application (FIG. 13; at 1308, the task may be performed based on the user input; paragraph 121). (*See Office Action*, pages 8 and 9).

The Examiner acknowledges that Brown does not disclose the second voice command associated with a second application. In view of this acknowledged deficiency of Brown, the Examiner asserts that Simpson discloses the second voice command associated with a second application (FIG. 4C, Steps 460-475: in step 460, an operation is retrieved from the reply message. Voice control application 212 utilizes the commands from reply 225 to control application program 211. Voice control application 212 causes application program 211 to transition from a first execution state to a second execution state. In another embodiment, voice control application 212 causes a software operating system on electronic device 210 to initiate a first execution state of application program 211. Voice control application program 212 retrieves the first operation from reply 225 and executes it; Paragraph 59). (*See Office Action*, page 9, last 2 paragraphs – page 10, paragraph 1).

The Examiner further asserts that it would have been obvious to modify the speech system as taught by Brown by adding the second voice command associated with a second application as taught by Simpson. (*See* Office Action, page 10, paragraph 3).

By way of overview, Brown describes a virtual assistant 112 interfacing with the user through a conversation user interface 118. (Paragraph 33). The device determines contextual information related to the conversation, such as conversation history of the user with the virtual assistant, an input mode that is currently or was previously used by the user to interact with the virtual assistant, information that is collected during a current conversation between the user and the virtual assistant, etc. (Paragraph 115).

Brown further describes receiving an input mode selection via a user touching an icon, thereby selecting a text input mode or a speech input mode. (Paragraphs 97-98). After receiving the input mode selection twice as a speech input mode, the device adapts the speech input mode based on the history information. (Paragraph 99).

Therefore, in these cited portions, Brown may describe receiving a first voice input and a second voice input upon user indicating the input mode as the speech input mode. That is, Brown may describe executing an action (i.e., a selection of an input mode) based on the context of the previously received user commands. However, the previously received user commands are associated with the same application, i.e., a selection of the input mode. Further, the selection of the input mode is performed by the user by touching an icon and not by inputting a voice command.

That is, Brown does not teach or suggest to “determine a relationship between the first voice command” received via the audio receiver and “a context of ... historic voice command associated with the first application” and “based on determining that there is the relationship

between the first voice command and the context of the ... historic voice command associated with the first application, perform at least one first action by executing the first voice command based on the context of the at least one historic voice command associated with the first application."

Further, Brown does not teach or suggest "based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, perform at least one second action by executing the second voice command with respect to the second application based on the context of the at least one historic voice command associated with the first application" which is different from the first application, wherein the second voice command is received via the audio receiver.

Simpson describes receiving a reply audio message from a user and retrieving an operation from the reply message, e.g., for controlling application program 211 to transition from a first execution state to a second execution state. A voice control application program 212 retrieves the first operation from reply 225 and executes it. The first operation may be to execute an operation from the application command list 226. (Paragraphs 57-60).

Thus, Simpson describes executing an operation from the pre-stored application command list 226 based on a user voice input.

However, similar to Brown, Simpson does not teach or suggest "determin[ing] a relationship between the second voice command and the context of the ... historic voice command associated with the first application," when the second voice command associated with a second application different from the first application.

Therefore, even if Brown were modified based on Simpson, as proposed by the Examiner, all of the features of claim 10 would not have been achieved.

Lastly, Mauro does not teach or suggest the above-noted features of claim 10 that are missing from Brown and Simpson.

Accordingly, Applicant respectfully submits that claim 10 is patentable over the combined references.

Independent claims 1 and 19 recite features similar to those discussed above with respect to claim 10. Therefore, Applicant respectfully submits that claims 1 and 19 are patentable at least for the reasons similar to those discussed above regarding claim 10.

Applicant respectfully submits that dependent claims 2-5, 7-9, 11-14, 16-18, and 21-23 are patentable at least by virtue of their respective dependencies.

IV. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.116
Appln. No.: 15/429,715

Attorney Docket No.: Q231458

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/ Marina V. Zalevsky /

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

Marina V. Zalevsky
Registration No. 53,825

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: December 3, 2018

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended) A method for performing voice based actions by an electronic device, the method comprising:

receiving, by the electronic device, a first voice command associated with a first application;

determining, by the electronic device, a relationship between the first voice command and a context of at least one historic voice command, ~~the least one historic voice command being~~ associated with the first application;

~~based on determining that there is the relationship between the first voice command and the context of the at least one historic voice command associated with the first application,~~

performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command ~~associated with the first application;~~

receiving, by the electronic device, a second voice command associated with a second application ~~different from the first application;~~

determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application;

and

~~based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application,~~

performing, by the electronic device, at least one second action by executing the second voice command ~~with respect to~~ the second application based on the context of the at least one historic voice command associated with the first application.

2. (currently amended) The method of claim 1, further comprising:

~~based on determining that in response to determining that~~ there is no relationship between the first voice command and the context of the at least one historic voice command, beginning a new context based on the first voice command, and performing, by the electronic device, ~~the~~ at least one first action by executing the first voice command based on the new context.

3. (previously presented) The method of claim 1, wherein the context of the at least one historic voice command is pre-analyzed and stored in the electronic device.

4. (Original) The method of claim 1, wherein the context of the at least one historic voice command is dynamically updated.

5. (previously presented) The method of claim 1, wherein the determining the relationship between the first voice command and the context of the at least one historic voice command comprises determining the relationship between the first voice command and the context of the at least one historic voice command based on at least one among a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command.

6. (Cancelled)

7. (currently amended) The method of claim 1, further comprising:

~~based on determining that in response to determining that~~ there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, beginning a new context based on the second voice command, and performing, by the electronic device, ~~the~~ at least one ~~second~~ action by executing the second voice command based on the new context.

8. (currently amended) The method of claim 1, ~~wherein the at least one first action comprises a search, further comprising: determining whether the first voice command is for performing a search or an action; and~~

~~the performing the at least one first action comprises; in response to determining that the first voice command is for performing the search,~~

beginning a new context based on the first voice command,
performing the search based on the first voice command, and
presenting a result of the search based on the first voice command.

9. (previously presented) The method of claim 1, wherein the at least one first action is performed by executing the first voice command based on a most recent context.

10. (currently amended) An electronic device for performing voice based actions,
the electronic device comprising:

an audio receiver configured to receive a first voice command associated with a first application; and

at least one ~~processor-microprocessor~~ configured to:

determine a relationship between the first voice command and a context of at least one historic voice command; ~~the at least one historic voice command~~ being associated with the first application,

based on determining that there is the relationship between the first voice command and the context of the at least one historic voice command associated with the first application. perform at least one first action by executing the first voice command based on the context of the at least one historic voice command associated with the first application,

wherein the audio receiver is further configured to:

receive a second voice command associated with a second application different from the first application, and

wherein the at least one ~~processor-microprocessor~~ is further configured to:

determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application, and

based on determining that there is the relationship between the second voice command and the context of the at least one historic voice command associated with the first application. perform at least one second action by executing the second voice command with respect to the second application

based on the context of the at least one historic voice command associated with
the first application.

11. (currently amended) The electronic device of claim 10, wherein the at least one ~~processor~~microprocessor is further configured to, based on determining that in response to
~~determining that~~ there is no relationship between the first voice command and the context of the
at least one historic voice command, begin a new context based on the first voice command, and
perform the at least one first action by executing the first voice command based on the new
context.

12. (previously presented) The electronic device of claim 10, wherein the context of
the at least one historic voice command is pre-analyzed and stored in the electronic device.

13. (Original) The electronic device of claim 10, wherein the context of the at least one
historic voice command is dynamically updated.

14. (currently amended) The electronic device of claim 10, wherein the at least one
~~processor~~microprocessor is further configured determine the relationship between the first voice
command and the context of the at least one historic voice command based at least one among a
semantic similarity, a latent semantic similarity, and an action performed based on the at least
one historic voice command.

15. (Cancelled)

16. (currently amended) The electronic device of claim 10, wherein the at least one ~~processormicroprocessor~~ is further configured to, ~~based on determining that in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, begin a new context based on the second voice command, and perform the at least one second action by executing the second voice command based on the new context.~~

17. (currently amended) The electronic device of claim 10, ~~wherein the at least one first action comprises a search, and~~
the at least one ~~processormicroprocessor~~ is further configured to:
~~determine whether the first voice command is for performing a search or an action; and in response to determining that the first voice command is for performing the search,~~
begin a new context based on the first voice command,
perform the search based on the first voice command, and
present a result of the search based on the first voice command.

18. (previously presented) The electronic device of claim 10, wherein the at least one first action is performed by executing the first voice command based on a most recent context.

19. (currently amended) A method comprising:
receiving, by a mobile device, a first voice command associated with a first application;
determining a first intent for the first voice command by parsing the first voice command;

matching the first intent with a pre-stored context of a previous user command;

performing, by the mobile device, a first action associated with the first application by executing the first voice command based on the matching of the first intent with the pre-stored context;

receiving, by the mobile device, a second voice command associated with a second application different from the first application;

determining a second intent for the second voice command by parsing the second voice command;

matching the second intent with the pre-stored context of the previous user command and the first application; and

performing, by the mobile device, a second action by executing the second voice command with respect to the second application based on the matching of the second intent with the pre-stored context within the first application.

20. (Cancelled)

21. (previously presented) The method of claim 1, wherein the at least one first action is executed based on a content used in the first application, and the at least one second action is executed based on at least a part of the content used in the first application.

22. (previously presented) The electronic device of claim 10, wherein the at least one first action is executed based on a content used in the first application, and the at least one second action is executed based on at least a part of the content used in the first application.

23. (previously presented) The method of claim 19, wherein the first action is executed based on a content used in the first application, and the second action is executed based on at least a part of the content used in the first application.

PATENT APPLICATION FEE DETERMINATION RECORD				Application or Docket Number	Filing Date	☐ To be Mailed	
Substitute for Form PTO-875				15/429,715	02/10/2017		
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO							
APPLICATION AS FILED - PART I							
	(Column 1)	(Column 2)					
FOR	NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(l))	minus 20 =	*		x \$80 =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x \$420 =			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.					TOTAL		
APPLICATION AS AMENDED - PART II							
	(Column 1)	(Column 2)	(Column 3)				
AMENDMENT	12/03/2018	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	x \$100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	x \$460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
				TOTAL ADD'L FEE	0		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
				TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.				SLIE			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".				/SHANDA E ROSS/			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".							
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.							

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

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067
23373 7590 10/02/2018 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER RILEY, MARCUS T	
			ART UNIT 2677	PAPER NUMBER
			NOTIFICATION DATE 10/02/2018	DELIVERY MODE ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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DETAILED ACTION

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

2. This office action is responsive to applicant's remarks received on July 05, 2018. **Claims 1-5, 7-14, 16-20** and newly added **claims 21-23** remain pending.

Response to Arguments

3. Applicant's arguments with respect to the amended claims filed on July 05, 2018 have been considered but are moot. However, upon further consideration, a new ground(s) of rejection is made in view of Brown et al. (US 20140317502 A1) in combination Simpson (US 20040054539 A1) and further in view of Mauro et al. (US 20140258324 A1).

Claim Interpretation - 35 USC § 112(f)

1. **Claim 10** has been interpreted under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, because it uses a non-structural term "configured to" coupled with functional language (As indicated in Steps (a-d) below) without reciting sufficient structure to achieve the function.

(a) "...receive a first voice command..."

(b) "...determine a relationship between the first voice command and a context of at least one historic voice command..."

(c) "...receive a second voice command associated with a second application..."

(d) "...determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application..."

Furthermore, the non-structural term is not preceded by a structural modifier. The limitations of **claim 10** that recites Steps (a-d) below is being treated in accordance with 35 U.S.C. 112(f) because the claimed function is not modified by specific structure that performs the function.

(a) "configured to receive a first voice command ..."

(b) "configured to determine a relationship between the first voice command and a context of at least one historic voice command..."

(c) "configured to receive a second voice command associated with a second application..."

(d) "configured to determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application..."

Since this claim limitation invokes 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, **Claim 10** interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation:

(a) Fig. 9, Step 902, Paragraph 0085

- (b) Fig. 9, Step 904, Paragraph 0086
- (c) Fig. 10, Step 1012, Paragraph 0094
- (d) Fig. 10, Step 1014, Paragraph 0094

2. **Claim 11** has been interpreted under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, because it uses a non-structural term “configured to” coupled with functional language “in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command, begin a new context based on the first voice command” without reciting sufficient structure to achieve the function. Furthermore, the non-structural term is not preceded by a structural modifier. The limitation of **Claim 11** that recites “configured to in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command, begin a new context based on the first voice command” is being treated in accordance with 35 U.S.C. 112(f) because the claimed function is not modified by specific structure that performs the function.

Since this claim limitation invokes 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, **Claim 11** interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation: Fig. 9, Step 908, Paragraph 0087

3. **Claim 14** has been interpreted under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, because it uses a non-structural term “configured to” coupled with functional language “determine the relationship between the first voice command and the context of the at least one historic voice command based at least one among a semantic similarity” without reciting sufficient structure to achieve the function. Furthermore, the non-structural term is not preceded by a structural modifier. The limitation of **Claim 14** that recites “configured to determine the relationship between the first voice command and the context of the at least one historic voice command based at least one among a semantic similarity” is being treated in accordance with 35 U.S.C. 112(f) because the claimed function is not modified by specific structure that performs the function.

Since this claim limitation invokes 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, **Claim 14** interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation: Fig. 8, Content Identification Unit 126, Paragraph 0070

4. **Claim 16** has been interpreted under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, because it uses a non-structural term “configured to” coupled with functional language “in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, begin a new context based on the second voice command” without reciting sufficient

structure to achieve the function. Furthermore, the non-structural term is not preceded by a structural modifier. The limitation of **Claim 16** that recites “configured to in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, begin a new context based on the second voice command” is being treated in accordance with 35 U.S.C. 112(f) because the claimed function is not modified by specific structure that performs the function.

Since this claim limitation invokes 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, **Claim 16** interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation: Fig. 10, Step 1018, Paragraph 0096

5. **Claim 17** has been interpreted under 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, because it uses a non-structural term “configured to” coupled with functional language “determine whether the first voice command is for performing a search or an action” without reciting sufficient structure to achieve the function. Furthermore, the non-structural term is not preceded by a structural modifier. The limitation of **Claim 17** that recites “configured to determine whether the first voice command is for performing a search or an action” is being treated in accordance with 35 U.S.C. 112(f) because the claimed function is not modified by specific structure that performs the function.

Since this claim limitation invokes 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph, **Claim 17** interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows that the following appears to be the corresponding structure described in the specification for the 35 U.S.C. 112(f) or 35 U.S.C. 112 (pre-AIA), sixth paragraph limitation: Fig. 11, Step 1106, Paragraph 0101

Claim Rejections - 35 USC § 101

(The previous claim rejection is withdrawn in light of the applicant's amendments.)

Claim Rejections - 35 USC § 103

1. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.
2. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claim 1, 3-10 & 12-23** are rejected under 35 U.S.C. 103 as being unpatentable over Brown et al. (US 20140317502 A1 hereinafter, Brown ‘502) in combination Simpson (US 20040054539 A1 hereinafter, Simpson ‘539).

Regarding claim 10; Brown ‘502 discloses an electronic device (Fig. 1, Device 102)

for performing voice based actions (i.e. input mode - whether the user prefers to submit a query textually using voice input. Paragraph 0046-0049),

the electronic device comprising:

an audio receiver (Fig. 9, Microphone 906),

configured to receive a first voice command (Fig. 9 i.e. At time t1, the conversation user interface 900 is presented with a text input field 904 and a microphone icon 906 to enable the user 104 to input text and/or input speech. Upon selection of the microphone icon 906 may enable a microphone of the smart device 102 (e.g., begin recording audio). In this example, at time t1, the user 104 selects the microphone icon 906 to input information through speech. Paragraphs 0097-0098)

associated with a first application (i.e. The memory 108 may include a client application 110 (e.g., module) configured to interface with the user 104. The client application 110 may receive any type of input from the user 104, such as audio or speech, text, touch, or gesture input received through a sensor of the smart device 102. The client application 110 may also provide any type of response, such as audio, text, interface items (e.g., icons, buttons, menu elements, etc.), and so on. In some implementations, the client application 110 is implemented as, or in association with, a mobile application, a browser (e.g., mobile browser), and so on. Paragraphs 0030-0031)

and at least one processor (i.e. The smart device 102 may be equipped with one or more processors 106. Paragraph 0030)

configured to:

determine a relationship between the first voice command and a context of at least one historic voice command, the at least one historic voice command being associated with the first application (i.e. The conversation user interface may display interface items that are based on contextual information (e.g., conversation history. Paragraph 0020)

perform at least one first action by executing the first voice command based on the context of the at least one historic voice command (i.e. At 1308, the smart device 102 may cause the task to be performed by the virtual assistant. The task may be performed based at least in part on the input that is received from the user. Paragraph 0121)

wherein the audio receiver is further configured to: receive a second voice command (i.e. At time t2, the conversation user interface 900 is presented again with the text input field 904 and the microphone icon 906 enabled to receive text and/or speech input. Here, the user 104 also selects the microphone icon 906 to provide speech input. Paragraph 0098),

and wherein the at least one processor is further configured to: determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application (i.e. The conversation user interface may display interface items that are based on contextual information e.g., conversation history. The conversation user interface 900 may adapt the input mode of the interface 900 based on one or more pieces of contextual information, in this example, input history indicating one or more input modes that the user 104 has previously used to interact with the conversation user interface 900. Paragraphs 0020 & 0099);

and perform at least one second action by executing the second voice command on the second application based on the context of the at least one historic voice command associated with the first application (i.e. At 1308, the smart device 102 may cause the task to be performed by the virtual assistant. The task may be performed based at least in part on the input that is received from the user. Paragraph 0121)

Although Brown '502 discloses wherein the audio receiver is further configured to receive a second voice command, Brown '502 does not expressly disclose wherein the second voice command is associated with a second application.

Simpson '539 discloses wherein the second voice command is associated with a second application (Fig. 4C, Steps 460-475 i.e. In step 460 of FIG. 4C, an operation is retrieved from the reply message. Voice control application 212 utilizes the commands from reply 225 to control application program 211. Voice control application 212 causes application program 211 to transition from a first execution state to a second execution state. In another embodiment,

voice control application 212 causes a software operating system on electronic device 210 to initiate a first execution state of application program 211. Voice control application program 212 retrieves the first operation from reply 225 and executes it. Paragraph 0059)

Brown '502 and Simpson '539 are combinable because they are from same field of endeavor of speech systems (Simpson '539 at "Background").

At the time the invention was effectively filed, it would have been obvious to a person of ordinary skill in the art to modify the speech system as taught by Brown '502 by adding wherein the second voice command is associated with a second application as taught by Simpson '539. The motivation for doing so would have been advantageous electronic devices to provide the comparable levels of performance required by numerous applications. Therefore, it would have been obvious to combine Brown '502 with Simpson '539 to obtain the invention as specified.

Regarding claim 12; Brown '502 discloses wherein the context of the at least one historic voice command is pre-analyzed and stored in the electronic device (i.e. In some instances, when a conversation is finished, the virtual assistant 112 may provide a conversation item 618 representing a history of the conversation, as illustrated in Fig. 6C. In this example, the conversation item 618 represents a history of the flight reservation conversation in a condensed format (e.g., with an icon). The user 104 may select the conversation item 618 and return to the conversation history as illustrated in Fig. 6A. Paragraph 0090)

Regarding claim 13; Brown '502 discloses wherein the context of the at least one historic voice command is dynamically updated (i.e. Fig. 9 updates the input mode of the conversation user interface 900 based on input received at two different instances, the input mode may be updated based on any number of previous input instances (e.g., when any threshold is met). Paragraph 0100).

Regarding claim 14; Brown '502 discloses wherein the at least one processor is further configured determine the relationship between the first voice command and the context of the at least one historic voice command based at least one among a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command (i.e. At 1204, the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation. The contextual information may comprise, for example, a location of a user, event information related to a past or future event associated with the user, environmental data obtained by a sensor of the smart device 102, a preference of the user, conversation history of the user with the virtual assistant in a current conversation, conversation history of the user with virtual assistant in a previous conversation, information that is needed for the virtual assistant to perform a task, an input mode that is currently or was previously used by the user to interact with the virtual assistant, information that is collected during a current conversation between the user and the virtual assistant, information that identifies an orientation of the smart device 102, and so on. Paragraph 0115)

Regarding claim 16; Simpson '539 discloses wherein the at least one processor is further configured to, in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, begin a new context based on the second voice command, and perform at least one action by executing the second voice command based on the new context (Fig. 4C, Steps 460-475 i.e. In step 460 of FIG. 4C, an operation is retrieved from the reply message. Voice control application 212 utilizes the commands from reply 225 to control application program 211. Voice control application 212 causes application program 211 to transition from a first execution state to a second execution state. In another embodiment, voice control application 212 causes a software operating system on electronic device 210 to initiate a first execution state of application program 211. Voice control application program 212 retrieves the first operation from reply 225 and executes it. Paragraph 0059).

Regarding claim 17; Brown '502 discloses the at least one processor is further configured to:

determine whether the first voice command is for performing a search or an action (Fig. 12 Steps 1202-1206 i.e. the smart device 102 may cause a conversation user interface to be presented on the smart device 102. At 1204, the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation. Paragraphs 0113-0116);

and in response to determining that the first voice command is for performing the search, begin a new context based on the first voice command, perform the search based on the first voice command, and present a result of the search based on the first voice command (Fig. 12, Step 1206 i.e. At 1206, the smart device 102 may cause one or more contextual conversation items to be presented within the conversation user interface based at least in part on the contextual information. Paragraphs 0113-0116).

Regarding claim 18; Brown '502 discloses wherein the at least one first action is performed by executing the first voice command based on a most recent context (Fig. 12, Step 1206 i.e. At 1206, the smart device 102 may cause one or more contextual conversation items to be presented within the conversation user interface based at least in part on the contextual information. Paragraphs 0113-0116).

Regarding claim 22; Simpson '539 discloses wherein the at least one first action is executed based on a content used in the first application, and the at least one second action is executed based on at least a part of the content used in the first application (Fig. 4C, Steps 460-475 i.e. In step 460 of FIG. 4C, an operation is retrieved from the reply message. Voice control application 212 utilizes the commands from reply 225 to control application program 211. Voice control application 212 causes application program 211 to transition from a first execution state to a second execution state. In another embodiment, voice control application 212 causes a software operating system on electronic device 210 to initiate a first execution state of application program 211. Voice control application program 212 retrieves the first operation from reply 225 and executes it. Paragraph 0059).

Regarding claims 1 & 19; Claims 1 & 19 contains substantially the same subject matter as claim 10. Therefore, claims 1 & 19 are rejected on the same grounds as claim 10.

Regarding claim 3; Claim 3 contains substantially the same subject matter as claim 12.
Therefore, claim 3 is rejected on the same grounds as claim 12.

Regarding claim 4; Claim 4 contains substantially the same subject matter as claim 13.
Therefore, claim 4 is rejected on the same grounds as claim 13.

Regarding claim 5; Claim 5 contains substantially the same subject matter as claim 14.
Therefore, claim 5 is rejected on the same grounds as claim 14.

Regarding claim 7; Claim 7 contains substantially the same subject matter as claim 16.
Therefore, claim 7 is rejected on the same grounds as claim 16.

Regarding claim 8; Claim 8 contains substantially the same subject matter as claim 17.
Therefore, claim 8 is rejected on the same grounds as claim 17.

Regarding claim 9; Claim 9 contains substantially the same subject matter as claim 18.
Therefore, claim 9 is rejected on the same grounds as claim 18.

Regarding claims 21 & 23; Claims 21 & 23 contains substantially the same subject matter as claim 22. Therefore, claims 21 & 23 are rejected on the same grounds as claim 22.

4. **Claims 2 & 11** are rejected under 35 U.S.C. 103 as being unpatentable over Brown '502 and Simpson '539 as applied above, and further in view of Mauro et al. (US 20140258324 A1 hereinafter, Mauro '324).

Regarding claim 11; Mauro '324 discloses wherein the at least one processor is further configured to, in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command, begin a new context based on the first voice command, and perform at least one action by executing the first voice

command based on the new context (i.e. When input is received at block 620 the process determines whether there is any context. Context is prior interactions, in the same session, which provide information used to interpret a request. If there is no context, at block 625 a query is created based on the input. If there is context, at block 630 an updated query is created based on the input and the context. The process then continues to block 635. Paragraphs 0078-0089).

Brown '502 and Simpson '539 are combinable because they are from same field of endeavor of speech systems (Simpson '539 at "Background").

At the time the invention was effectively filed, it would have been obvious to a person of ordinary skill in the art to modify the speech system as taught by Brown '502 by adding wherein the at least one processor is further configured to, in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command, begin a new context based on the first voice command, and perform at least one action by executing the first voice command based on the new context as taught by Simpson '539. The motivation for doing so would have been advantageous for providing a device that can assist a user more efficiently. Therefore, it would have been obvious to combine Brown '502 with Simpson '539 to obtain the invention as specified.

Regarding claim 2; Claim 2 contains substantially the same subject matter as claim 11. Therefore, claim 2 is rejected on the same grounds as claim 11.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS T. RILEY, ESQ. whose telephone number is (571)270-1581. The examiner can normally be reached on 9-5.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tammy Paige Goddard can be reached on (571) 272-7773. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MARCUS T. RILEY, ESQ./
Primary Examiner, Art Unit 2677

Notice of References Cited	Application/Control No. 15/429,715		Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.	
	Examiner MARCUS T. RILEY, ESQ.		Art Unit 2677	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2004/0054539 A1	03-2004	Simpson, Nigel D.	G10L15/30	704/270.1
*	B	US-2011/0055256 A1	03-2011	Phillips; Michael S.	G10L15/30	707/769
*	C	US-7,933,226 B2	04-2011	Woodruff; Allison G.	H04M3/568	370/260
*	D	US-2014/0258324 A1	09-2014	Mauro; David Andrew	G06F17/30392	707/766
*	E	US-2014/0317502 A1	10-2014	Brown; Fred A.	G06F9/453	715/706
*	F	US-2015/0003595 A1	01-2015	Yaghi; Mudar	G06Q10/063	379/85
*	G	US-8,958,848 B2	02-2015	Shin; Jong-Ho	H04M1/72583	455/563
*	H	US-2015/0142704 A1	05-2015	London; Justin	G06N5/04	706/11
*	I	US-9,070,366 B1	06-2015	Mathias; Lambert	G06F17/279	1/1
*	J	US-2017/0236513 A1	08-2017	CHOUDHURY; Arunabha	G10L15/063	704/244
	K	US-				
	L	US-				
	M	US-				

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	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15429715"	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:27
S2	1	"20140317502"	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:30
S3	1	"20140258324"	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:30
S4	3	S1 S2 S3	US-PGPUB; USPAT	OR	OFF	2018/08/13 16:30
S5	1	"15429715"	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S6	1	"20140317502"	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S7	1	"20140258324"	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S8	3	S5 S6 S7	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S9	2	S8 and (electroni\$4 and devic\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S10	3	S8 and (voice\$4 and process\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:52
S11	3	S10 and devic\$4	US-PGPUB; USPAT	OR	OFF	2018/09/26 23:54
S12	11232	(G10L15/06 G10L15/18 G10L15/22 G10L15/063 G10L15/1815 G10L15/1822 G10L015/06 G10L015/18 G10L015/22 G10L2015/0635 G10L2015/223 G10L2015/228). qpc.	US-PGPUB; USPAT	OR	OFF	2018/09/27 12:52
S13	50	"5703902".pn. "5850429".pn. "4598397".pn. "4907259".pn. "4907267".pn. "5181247".pn. "5367506".pn. "5590094".pn. "5574966".pn. "5701592".pn. "5790551".pn. "5805995".pn. "5835779".pn. "5885100".pn. "5917889".pn. "6009129".pn. "6028925".pn. "6088435".pn. "6112103".pn. "6131044".pn. "6181862".pn. "6240223".pn. "20130115977" "8768385".pn. "8909260".pn. "20140025847" "9529738".pn. "20170083460" "20120294173"	US-PGPUB; USPAT	OR	OFF	2018/09/27 12:55

		"9973942".pn. "20040125754" "20070205283" "20070226632" "20130110565" "20150003595" "5883341".pn. "4592048".pn. "4596010".pn. "5550905".pn. "5881373".pn. "5920834".pn. "4280157".pn. "4287566".pn. "4289935".pn. "4365111".pn. "4396801".pn. "4400591".pn. "4405671".pn. "4443856".pn.				
S14	1801	704/244	US- PGPUB; USPAT	OR	OFF	2018/09/27 12:55
S15	3623	704/243	US- PGPUB; USPAT	OR	OFF	2018/09/27 12:56
S16	46062	704/ 1-504.ccls.	US- PGPUB; USPAT	OR	OFF	2018/09/27 12:56
S17	1	"15429715"	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S18	1	"20140317502"	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S19	1	"20140258324"	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S20	3	S17 S18 S19	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S21	3	S20 and (voice\$4 and process\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S22	3	S21 and devic\$4	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S23	3	S22 and mobil\$4	US- PGPUB; USPAT	OR	OFF	2018/09/27 14:41
S24	2	S23 and (audio\$4 and microphon\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 15:16
S25	1	"7421390".pn.	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:32
S26	1	"10244131"	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:33
S27	1	S26 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and voic\$4	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:36
S28	2	"20040054539"	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:41
S29	2	S28 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and voic\$4	US- PGPUB; USPAT	OR	OFF	2018/09/27 16:41
S30	2	S24 and (histor\$8 and stor\$4)	US- PGPUB;	OR	OFF	2018/09/27 17:06

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S31	0	S24 and (histor\$8 near5 stor\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 17:06
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S33	1	S32 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and (voic\$4 and mobil\$4) and (histor\$8 and stor\$4) and (audio\$4 and microphon\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:56
S34	11232	(G10L15/06 G10L15/18 G10L15/22 G10L15/063 G10L15/1815 G10L15/1822 G10L015/06 G10L015/18 G10L015/22 G10L2015/0635 G10L2015/223 G10L2015/228).opc.	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
S35	1801	704/244	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
S36	3623	704/243	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
S37	46062	704/1-504.ccls.	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
S38	52671	S34 S35 S36 S37	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
S39	1559	S38 and (electronic\$4 and devic\$4) and (application\$4 and command\$4) and (voic\$4 and mobil\$4) and (histor\$8 and stor\$4) and (audio\$4 and microphon\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:57
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S41	425	S40 and (histor\$8 and stor\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:58
S42	1559	S39 and (histor\$8 and stor\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:58
S43	425	S42 and (histor\$8 near5 stor\$4)	US- PGPUB; USPAT	OR	OFF	2018/09/27 20:59

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S44	286	S43 and (voic\$8 near5 command\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 20:59
S45	253	S44 and (application\$8 and context\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:00
S46	118	S45 and semantic\$4	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
S47	118	S46 and receiv\$4	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
S48	227	S43 and (audio\$8 near5 receiv\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
S49	227	S48 and (audio\$8 near5 receiv\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:02
S50	58	S47 and (audio\$8 near5 receiv\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:03
S51	58	S50 and process\$6	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:03
S52	36	S51 and (execut\$8 near5 command\$4)	US-PGPUB; USPAT	OR	OFF	2018/09/27 21:04

EAST Search History (Interference)

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Search Notes 	Application/Control No. 15429715	Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.
	Examiner KEARA HARRIS	Art Unit 2677

CPC- SEARCHED		
Symbol	Date	Examiner
G10L15/22 or G10L15/063 or G10L15/1822 or G10L15/1815 or G10L2015/228 or G10L2015/223 or G10L2015/0635 or G10L15/065 or G10L15/07 or G10L15/20 or G10L2015/0631	03/29/2018	KH
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(G10L15/18) Text Search Only - See Search History Printout	9/27/2018	MTR
(G10L15/22) Text Search Only - See Search History Printout	9/27/2018	MTR
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(G10L15/1815) Text Search Only - See Search History Printout	9/27/2018	MTR
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(G10L2015/228) Text Search Only - See Search History Printout	9/27/2018	MTR

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
704	(243, 244, 1-504) Text Search Only - See Search History Printout	9/27/2018	MTR
G10L15	(06, 18, 22, 063, 1815, 1822) Text Search Only - See Search History Printout	9/27/2018	MTR
G10L015	(06, 18, 22) Text Search Only - See Search History Printout	9/27/2018	MTR
G10L2015	(0635, 223, 228) Text Search Only - See Search History Printout	9/27/2018	MTR

/K.H./ Examiner.Art Unit 2677	
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* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Consulted SPE Tammy Pham	03/30/2018	KH
STIC Plus Search	9/27/2018	MTR
Google Patents - Search Terms (Electronic, Device, Voice, Command, Actions, Execute)	9/27/2018	MTR
IP.com - Search Terms (Electronic, Device, Voice, Command, Actions, Execute)	9/27/2018	MTR
(704/244) Text Search Only - See Search History Printout	9/27/2018	MTR
(704/243) Text Search Only - See Search History Printout	9/27/2018	MTR
(704/1-504) Text Search Only - See Search History Printout	9/27/2018	MTR
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(G10L2015/228) Text Search Only - See Search History Printout	9/27/2018	MTR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/K.H./
Examiner.Art Unit 2677

Index of Claims 	Application/Control No. 15429715	Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.
	Examiner KEARA HARRIS	Art Unit 2677

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		DATE							
Final	Original	03/30/2018	09/27/2018						
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	2	✓	✓						
	3	✓	✓						
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	6	✓	-						
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	21		✓						
	22		✓						
	23		✓						

PLUS Search Results for S/N 15429715, Searched Thu Sep 27 10:23:03 EDT 2018
The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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4400591 76	
4405671 76	

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2677

Confirmation No.: 5067

Examiner: HARRIS, KEARA S

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

AMENDMENT UNDER 37 C.F.R. § 1.111

MAIL STOP AMENDMENT

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

Sir:

In response to the Office Action dated April 5, 2018, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS	2
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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) A method for performing voice based actions by an electronic device, the method comprising:

receiving, by the electronic device, a first voice command associated with a first application from a user;

determining, by the electronic device, a relationship between the first voice command and a context of at least one historic voice command of the user, the least one historic voice command being associated with the first application; and

performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command;

receiving, by the electronic device, a second voice command associated with a second application;

determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application;

and

performing, by the electronic device, at least one second action by executing the second voice command on the second application based on the context of the at least one historic voice command associated with the first application.

2. (Currently Amended) The method of claim 1, further comprising:
in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command ~~of the user~~, beginning a new context based on the first voice command, and performing, by the electronic device, at least one action by executing the first voice command based on the new context.

3. (Currently Amended) The method of claim 1, wherein the context of the at least one historic voice command ~~of the user~~ is pre-analyzed and stored in the electronic device.

4. (Original) The method of claim 1, wherein the context of the at least one historic voice command is dynamically updated.

5. (currently amended) The method of claim 1, wherein the determining the relationship between the first voice command and the context of the at least one historic voice command comprises determining the relationship between the first voice command and the context of the at least one historic voice command based on at least one ~~of~~ among a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command.

6. (Cancelled)

7. (Currently Amended) The method of ~~claim 1~~ claim 6, further comprising:

in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application, ~~beginning a new context based on the second voice command, and performing, by~~ the electronic device, at least one action by executing the second voice command based on the new context.

8. (currently amended) The method of claim 1, further comprising:

determining whether the first voice command is for performing a search or an action; and

in response to determining that the first voice command is for performing ~~a search~~ the ~~search~~, beginning a new context based on the first voice command, performing ~~a search~~ the ~~search~~ based on the first voice command, and presenting a result of the search based on the first voice command.

9. (currently amended) The method of claim 1, wherein the at least one first action

is performed by executing the first voice command based on a most recent context.

10. (Currently Amended) An electronic device for performing voice based actions,

the electronic device comprising:

an audio receiver configured to receive a first voice command associated with a first ~~application; from a user;~~ and

~~a~~ at least one processor configured to:

determine a relationship between the first voice command and a context of
at least one historic voice command ~~of the user~~, the at least one historic voice
command being associated with the first application, and
perform at least one first action by executing the first voice command
based on the context of the at least one historic voice command,
wherein the audio receiver is further configured to:
receive a second voice command associated with a second application, and
wherein the at least one processor is further configured to:
determine a relationship between the second voice command and the
context of the at least one historic voice command associated with the first
application, and
perform at least one second action by executing the second voice
command on the second application based on the context of the at least one
historic voice command associated with the first application.

11. (Currently Amended) The electronic device of claim 10, wherein the at least one
processor is further configured to, in response to determining that there is no relationship
between the first voice command and the context of the at least one historic voice command ~~of~~
~~the user~~, begin a new context based on the first voice command, and perform at least one action
by executing the first voice command based on the new context.

12. (Currently Amended) The electronic device of claim 10, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.

13. (Original) The electronic device of claim 10, wherein the context of the at least one historic voice command is dynamically updated.

14. (Currently Amended) The electronic device of claim 10, wherein the at least one processor is further configured determine the relationship between the first voice command and the context of the at least one historic voice command based at least one among a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command.

15. (Cancelled)

16. (Currently Amended) The electronic device of claim 10~~claim 15~~, wherein the at least one processor is further configured to, in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application: begin a new context based on the second voice command; and perform at least one action by executing the second voice command based on the new context.

17. (Currently Amended) The electronic device of claim 10, the at least one processor is further configured to:

determine whether the first voice command is for performing a search or an action; and

in response to determining that the first voice command is for performing ~~a search~~ the ~~search~~, begin a new context based on the first voice command, perform ~~a search~~ the search based on the first voice command, and present a result of the search based on the first voice command.

18. (currently amended) The electronic device of claim 10, wherein the at least one first action is performed by executing the first voice command based on a most recent context.

19. (Currently Amended) A method comprising:

receiving, by a mobile device, a first voice command ~~of a user~~ associated with a first application;

determining ~~an a first intent of the user for the first voice command~~ by parsing the first voice command;

matching the ~~determined first intent of the user~~ with a pre-stored context of a previous user command; ~~and~~

performing, by the mobile device, a first action associated with the first application by executing the first voice command based on the ~~matched~~ matching of the first intent with the pre-stored context;

receiving, by the mobile device, a second voice command associated with a second application;

determining a second intent for the second voice command by parsing the second voice command;
matching the second intent with the pre-stored context of the previous user command and the first application; and
performing, by the mobile device, a second action by executing the second voice command on the second application based on the matching of the second intent with the pre-stored context within the first application.

20. (Cancelled)

21. (new) The method of claim 1, wherein the at least one first action is executed based on a content used in the first application, and the at least one second action is executed based on at least a part of the content used in the first application.

22. (new) The electronic device of claim 10, wherein the at least one first action is executed based on a content used in the first application, and the at least one second action is executed based on at least a part of the content used in the first application.

23. (new) The method of claim 19, wherein the first action is executed based on a content used in the first application, and the second action is executed based on at least a part of the content used in the first application.

REMARKS

I. Application Status

By this Amendment, Applicant amends claims 1-3, 5, 7-12, 14, 16-19, cancels claims 6, 15, and 20, and adds claims 21-23. No new matter has been added.

Thus, claims 1-5, 7-19, and 21-23 are all the claims pending in the application.

Reconsideration and allowance of the claims are respectfully requested.

II. Preliminary Matters

Applicant thanks the Examiner for acknowledging Applicant's claim to foreign priority and confirming receipt of the certified copy of the Priority Document.

Applicant also thanks the Examiner for considering the references listed on the PTO/SB/08 form submitted with the Information Disclosure Statement filed July 21, 2017, and accepting the drawings filed February 10, 2017.

III. Claim Rejections Under 35 U.S.C. § 101

Claims 1-20 are rejected under § 101 because the claimed invention is allegedly directed to a judicial exception (i.e., a law of nature, a natural phenomenon, or an abstract idea) without significantly more.

According to a two-prong test for patent-eligibility under *Alice*, one must first determine whether the claim is directed to a law of nature, a natural phenomenon, or an abstract idea (collectively, the judicial exceptions). If so, then one must further determine whether any element, or combination of elements, in the claim is sufficient to ensure that the claim amounts to significantly more than a judicial exception, wherein the second prong determination is made

only if it is determined that the claim is directed to the judicial exception according to the first prong.

Applicant respectfully submits that based on the two-part analysis, independent claim 1 is not patent-ineligible under § 101.

The Examiner asserts that the claim is “directed to” a judicial exception, namely, abstract idea. Claim 1, however, is *not* directed to a law of nature, a natural phenomenon, or an abstract idea. Unless the claims *recite* a judicial exception, i.e., a law of nature, a natural phenomenon, or an abstract idea, they cannot be “directed to” the judicial exception.

For example, claim 1 recites an electronic device which is a tangible hardware component and NOT the abstract idea.

Additionally, it is respectfully submitted that unlike *Alice*, the claimed invention is necessarily rooted in computer-assisted technology and the features of claim 1 necessarily involve intense mathematical computations on a hardware processor, so that the features of claim 1 cannot be performed in somebody's head or on a piece of paper and, as such, the claimed invention is not an abstract idea. This is unlike *Alice*, where the features of the claims were directed to the long established method which was performed manually and/or mentally for a long period of time.

Therefore, according to the USPTO’s patent examination policy on subject matter eligibility, claim 1 is NOT “directed to” a law of nature, a natural phenomenon, or an abstract idea.

Applicant respectfully requests the Examiner to reconsider this rejection. The claim is not directed to the so-called judicial exception mentioned in the Office Action, and therefore is directed to patent-eligible subject matter under § 101.

Further, it is respectfully submitted that the amended claim 1 recites significantly more than an abstract idea.

Claims 10 and 19 directed to patent-eligible subject matter under § 101 for at least similar reasons as those discussed for claim 1.

Accordingly, withdrawal of the foregoing rejection is respectfully requested.

IV. Claim Rejections Under 35 U.S.C. § 103

Claims 1-20 are rejected under § 103 as being unpatentable over Brown (US 2014/0317502) in view of Mauro (US 2014/0258324).

Claim 1 recites among other features:

receiving, by the electronic device, a first voice command associated with a first application;

determining, by the electronic device, a relationship between the first voice command and a context of at least one historic voice command, the least one historic voice command being associated with the first application;

performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command;

receiving, by the electronic device, a second voice command associated with a second application;

determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and

performing, by the electronic device, at least one second action by executing the second voice command on the second application based on the context of the at least one historic voice command associated with the first application.

The Examiner asserts that Brown describes receiving, by the electronic device (FIG. 1; 102), a first command from a user (The smart device 102 may cause a conversation user

interface to be presented on the smart device 102. The conversation user interface may enable a conversation between a user of the smart device 102; [0114]; FIG. 12: item 1202; the smart device 102 may receive input from the user that selects a conversation item of the multiple conversation items and drags the selected conversation item to another conversation item of the multiple conversation items; [0120]; FIG. 12: item 1306); determining a relationship between the first command and a context of at least one historic command of the user (the smart device 104 may identify contextual information that is related to the conversation comprising conversation history of the user with the virtual assistant in a current conversation, conversation history of the user with virtual assistant in a previous conversation; [0115]); and performing, by the electronic device, an action by executing the first voice command based on the context of the historic command (the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform the requested task (e.g., check-in "0" bags); [0095], FIG. 8; the smart device 102 may cause the task to be performed by the virtual assistant. The task may be performed based at least in part on the input that is received from the user (e.g., the answer to the inquiry); [0121], FIG. 13; item 1308). (See Office Action, page 6, line 1 - page 7, line 5).

The Examiner acknowledges that Brown fails to teach the electronic device receiving a voice command from a user to perform at least one action and performing the action by executing the first voice command based on the context of a historic voice command. (See Office Action, page 7, paragraph 2).

The Examiner asserts that Mauro teaches the electronic device receiving a voice command from a user (the process determines whether input has been received that may be

speech, [0087], FIG. 6; item 615) to perform at least one action (At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken; [0099], FIG. 7; item 760, FIG. 5B), based on the context of a historic voice command (When input is received at block 620 the process determines whether there is any context. Context is prior interactions, in the same session, which provide information used to interpret a request, [0088], FIGS. 6 and 7). (*See* Office Action, page 7, paragraph 7).

The Examiner further asserts it would be obvious to implement the teachings of Mauro into Brown to achieve the electronic device which receives a voice command from a user to perform an action, based on the context of a historic voice command. (*See* Office Action, bridging paragraph at pages 7-8).

Brown describes the virtual assistant 112 interfacing with the user through a conversation user interface 118. (Paragraph 33). The device may determine contextual information that is related to the conversation, such as conversation history of the user with the virtual assistant, an input mode that is currently or was previously used by the user to interact with the virtual assistant, information that is collected during a current conversation between the user and the virtual assistant, etc. (Paragraph 115).

Further, the Examiner appears to interpret the user touch and drag input of item 802 onto item 804, as the first voice command. (*See* Office Action, bridging paragraph at pages 6-7 and page 10, last paragraph).

In the cited portion, Brown discloses as follows:

FIG. 8 illustrates an example conversation user interface 800 for receiving input from the user 104 through dragging a conversation item onto another conversation item. In this example, the virtual assistant 112 is requesting

information to perform a task (e.g., check-in bags for the user 104). To obtain the information, the virtual assistant 112 presents an inquiry for the user 104 to respond to, namely "How many bags would you like to check for you flight today?" The inquiry is based on a conversation with the user 104. The inquiry is represented by presenting conversation items 802-810 such that the item 802 is movable and the items 804-810 receive the item 802. The user 104 may answer the inquiry by moving the item 802 onto (e.g., on top of) or in contact with one of the items 804-810. In this example, the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform the requested task (e.g., check-in "0" bags). Although the example conversation interface 800 illustrates five conversation items (e.g., conversation items 802-810) to answer an inquiry, any number of conversation items may be used. (Paragraph 95).

Thus, Brown describes that, in response to the inquiry posed by the virtual assistant, a user responds by touching and dragging an item on the screen.

However, Brown does not teach or suggest at least "performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command; ... determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and performing, by the electronic device, at least one second action by executing the second voice command on the second application based on the context of the at least one historic voice command associated with the first application."

Mauro describes a voice command. However, similar to Brown, Mauro does not teach or suggest at least the claimed "performing, by the electronic device, at least one first action by executing the first voice command based on the context of the at least one historic voice command; ... determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and performing, by the electronic device, at least one second action by executing the

second voice command on the second application based on the context of the at least one historic voice command associated with the first application."

Even if Brown were modified based on Mauro, all of the features of claim 1 would not have been achieved.

Accordingly, Applicant respectfully submits that claim 1 is patentable because the combined references do not teach or suggest all of the features of the claim.

Independent claims 10 and 19 recite features similar to those discussed above with respect to claim 1. Therefore, Applicant respectfully submits that claims 10 and 19 are patentable at least for the reasons similar to those discussed above regarding claim 1.

Applicant respectfully submits that dependent claims 2-5, 7-9, 11-14, and 16-18 are patentable at least by virtue of their respective dependencies.

V. New Claims

Applicant adds new dependent claims 21-23. Applicant respectfully submits that claims 21-23 are patentable at least by virtue of their respective dependencies and the additional novel features recited therein.

VI. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111
Appln. No.: 15/429,715

Attorney Docket No.: Q231458

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/ Marina V. Zalevsky /

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

Marina V. Zalevsky
Registration No. 53,825

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: July 5, 2018

Electronic Acknowledgement Receipt	
EFS ID:	33099328
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Christopher Robert Lipp/Evelyn Jacob
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	05-JUL-2018
Filing Date:	10-FEB-2017
Time Stamp:	17:15:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231458Amendment111.pdf	72182 0990e1f7fa707636e7b5111edd1bef3760448eaa	yes	16

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	8
	Applicant Arguments/Remarks Made in an Amendment	9	16
Warnings:			
Information:			
Total Files Size (in bytes):		72182	
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>			

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

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 15/429,715		Filing Date 02/10/2017		☐ To be Mailed	
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO									
APPLICATION AS FILED – PART I									
(Column 1)		(Column 2)							
FOR		NUMBER FILED		NUMBER EXTRA		RATE (\$)		FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A		N/A		N/A			
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A		N/A		N/A			
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A		N/A		N/A			
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =		*		X \$ =			
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).							
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL			
APPLICATION AS AMENDED – PART II									
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT	07/05/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	x \$100 =		0	
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	x \$460 =		0	
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
TOTAL ADD'L FEE						0			
(Column 1)		(Column 2)		(Column 3)					
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =			
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =			
	☐ Application Size Fee (37 CFR 1.16(s))								
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
TOTAL ADD'L FEE									
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.									

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

LIE
ANTHONY WILLIAMS



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/429,715	02/10/2017	Arunabha CHOUDHURY	Q231458	5067
23373 7590 04/05/2018 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER HARRIS, KEARA S	
			ART UNIT 2677	PAPER NUMBER
			NOTIFICATION DATE 04/05/2018	DELIVERY MODE ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

Office Action Summary	Application No. 15/429,715	Applicant(s) CHOUDHURY ET AL.	
	Examiner KEARA HARRIS	Art Unit 2677	AIA (First Inventor to File) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1) ☒ Responsive to communication(s) filed on 10 February 2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☒ Claim(s) 1-20 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6) ☐ Claim(s) ____ is/are allowed.

7) ☒ Claim(s) 1-20 is/are rejected.

8) ☐ Claim(s) ____ is/are objected to.

9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 10 February 2017 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some** c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. ____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date ____.

3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.

4) ☐ Other: ____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to a judicial exception (i.e., a law of nature, a natural phenomenon, or an abstract idea) without significantly more.

Claims 1, 10, and 19 are directed to a process (Claim 1 and Claim 19) and a system (Claim 10)

Step 2A:

Claims 1 and 10 requires an electronic device for performing voice based user actions based upon a context of at least one history voice command. More specifically the claims require,

“receiving, by the electronic device, a first voice command from a user;

determining, by the electronic device, a relationship between the first voice command

and a context of at least one historic voice command of the user; and

performing, by the electronic device, at least one action by executing the first voice command based on the context of the at least one historic voice command...”

Claim 19 requires a mobile for performing voice based user actions based upon a matched context and intent of a previous user command. More specifically the claims require,

receiving, by a mobile device, a first voice command of a user; determining an intent of the user by parsing the first voice command;

matching the determined intent of the user with a pre-stored context of a previous user command; and

performing, by the mobile device, a first action by executing the first voice command based on the matched context.

Accordingly, Claims 1, 10, and 19 are directed to concepts relating to the abstract idea of "An Idea 'Of Itself.'" In that the process compares and analyzes data to determine if it is an appropriate user. Example court cases related to the claims and found to be abstract include, but are not limited to: Filtering Content (BASCOT), Monitoring Delivery of real-time information to users (Two-way Media), and Tailoring content based on information about the user (Int. Ventures v Cap One Bank).

Step 2B,

The claims do not include additional elements that are sufficient to amount to significantly more than the judicial exception such as improvements to another technology or

technical field, or other meaningful limitations beyond generally linking the use of the judicial exception to a particular technological environment.

Moreover, the claim language that may be separate from the abstract idea (i.e., additional elements) includes **an electronic device (Claims 1 and 10) , an audio receiver (Claims 10), processor (Claim 10), and a mobile device (Claim 19)**

The **an electronic device/mobile device, audio receiver, and processor** perform only basic function, which would be common to every **an electronic device/mobile device with an audio receiver and processor**. Thus, the recited elements of **an electronic device/mobile device with an audio receiver and processor** perform no more than their basic computer function. Generic computer- implementation of a method is not a meaningful limitation that alone can amount to significantly more than an abstract idea. Moreover, when viewed as a whole with such additional element considered as an ordered combination, claims modified by adding a generic memory are nothing more than a purely conventional computerized implementation of an idea in the general field of computer processing and do not provide significantly more than an abstract idea.

Consequently, the identified additional elements taken into consideration individually and in combination fail to amount to significantly more than the abstract idea above.

The dependent claims **2-9** add limitations that only further define the rules, such as the creation or updating of new or existing context information, receiving of a second voice command, and the relationship between the voice command and the context information, for the abstract idea above and/or do not cause the claims to be significantly more than the abstract idea

above. Accordingly, the dependent claims do not amount to significantly more than the recited abstract idea above and are therefore not patent eligible.

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-20 are rejected under 35 U.S.C. 103 as being unpatentable over Brown et al. (US 2014/0317502 A1), hereinafter referred to as Brown, in view of Mauro et al. (2014/0258324 A1), hereinafter referred to as Mauro.

Regarding Claim 1, Brown teaches of a method for performing voice based actions (as displayed in Figure 13) by an electronic device (“...For example, the smart device 102 may be implemented as a laptop computer, a desktop computer, a server, a smart phone, an electronic reader device, a mobile handset, a personal digital assistant (PDA)...” as taught in section [0029 and “device” as displayed in Figure 1; item 102), the method comprising:

receiving, by the electronic device (“device” as displayed in Figure 1; item 102) , a first command from a user (“...The smart device 102 may cause a conversation user interface to be presented on the smart device 102. The conversation user interface may enable a conversation between a user of the smart device 102...” as taught in section [0114] and as displayed in Figure 12; item 1202 and “...the smart device 102 may receive input from the user that selects a conversation item of the multiple conversation items and drags the selected conversation item to another conversation item of the multiple conversation items.” As taught in section [0120] and as displayed in Figure 12; item 1306);

determining, by the electronic device (“device” as displayed in Figure 1; item 102), a relationship between the first command and a context of at least one historic command of the user (“...the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation. The contextual information may comprise, for example, a location of a user, event information related to a past or future event associated with the user, environmental data obtained by a sensor of the smart device 102, a preference of the user...conversation history of the user with the virtual assistant in a current conversation, conversation history of the user with virtual assistant in a previous conversation...” as taught in section [0115]); and

performing, by the electronic device, at least one action by executing the first voice command based on the context of the at least one historic command (“...In this example, the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform

the requested task (e.g., check-in "0" bags)." As taught in section [0095] and as displayed in Figure 8) and "...the smart device 102 may cause the task to be performed by the virtual assistant. The task may be performed based at least in part on the input that is received from the user (e.g., the answer to the inquiry)." As taught in section [0121] and as displayed in Figure 13; item 1308).

Brown fails to teach of the concept of the electronic device receiving a voice command from a user to perform at least one action and performing the action by executing the first voice command based on the context of a historic voice command.

However Mauro teaches of the concept of the electronic device receiving a voice command from a user ("**the process determines whether input has been received. As noted above, input may be speech, typing/text, motion, or another format...**" as taught in section [0087] and as displayed in Figure 6; item 615) to perform at least one action ("**... At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken.**" As taught in section [0099] and as displayed in Figure 7; item 760 and as displayed in Figure 5B), based on the context of a historic voice command ("**When input is received at block 620 the process determines whether there is any context. Context is prior interactions, in the same session, which provide information used to interpret a request.**" As taught in section [0088], in that in order for the task to be executed (as displayed in Figure 7), the context first has to be determined (as displayed in Figure 6)).

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant's invention for the electronic device receiving a voice

command from a user to perform an action, based on the context of a historic voice command and while the historic command information of the Brown refers not necessarily to a speech input but to a touch input, the historic information of the Mauro pertains to the input speech (voice) command and thus would be combinable for the advantage of providing a device that can assist a user more efficiently as taught by Mauro (section [0023]).

Regarding Claim 2, Brown as modified by Mauro, above in Claim 1, continues to teach of, further comprising, in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command of the user (**Mauro: “If there is no context...” as taught in section [0088]**):

beginning a new context based on the first voice command (**Mauro: “...Context is prior interactions, in the same session, which provide information used to interpret a request. If there is no context, at block 625 a query is crated based on the input.” As taught in section [0088] and “create query based on input” as displayed in Figure 6; item 625**); and

performing, by the electronic device, at least one action by executing the first voice command based on the new context (**Mauro: “... At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken.” As taught in section [0099] and as displayed in Figure 7; item 760 and as displayed in Figure 5B**).

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant’s invention for in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice

command of the user, beginning a new context based on the first voice command, and performing, by the electronic device, at least one action by executing the first voice command based on the new context for the advantage of providing a device that can assist a user more efficiently as taught by Mauro (section [0023]).

Regarding Claim 3, Brown as modified by Mauro, continues to teach of, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device (Brown: “...the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation. The contextual information may comprise, for example, a location of a user, event information related to a past or future event associated with the user, environmental data obtained by a sensor of the smart device 102, a preference of the user...conversation history of the user with the virtual assistant in a current conversation, conversation history of the user with virtual assistant in a previous conversation...” as taught in section [0115] and as displayed in Figure 12; item 1204).

Regarding Claim 4, Brown as modified by Mauro, above in Claim 1, continues to teach of, wherein the context of the at least one historic voice command is dynamically updated (Mauro: “...whenever a command is successfully interpreted, context updater 254 updates the context so that subsequent commands utilize the up-to-date context information.” As taught in section [0044] and “...The process then continues to block 660, to update context, before returning to block 615, to await input of the additional data.” As taught in section [0092] and as displayed in Figure 6; item 660).

Regarding Claim 5, Brown as modified by Mauro, above in Claim 1, continues to teach of, wherein the determining the relationship between the first voice command and the context of the at least one historic voice command comprises determining the relationship between the first voice command and the context of the at least one historic voice command based on at least one of a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command (**Brown: “...the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation. The contextual information may comprise, for example, a location of a user, event information related to a past or future event associated with the user, environmental data obtained by a sensor of the smart device 102, a preference of the user...conversation history of the user with the virtual assistant in a current conversation, conversation history of the user with virtual assistant in a previous conversation...” as taught in section [0115]).**

Regarding Claim 6, Brown as modified by Mauro, above in Claim 1, continues to teach of The method of claim 1, wherein the first voice command is associated with a first application (**Brown: “In this example, the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform the requested task (e.g., check-in "0" bags), the at least one historic voice command is associated with the first application (Brown: “...Contextual information may be stored in a context data store 138. Example, non-limiting pieces of contextual information may include: [0047] interaction information between a user and a virtual assistant, either during the current session or during a previous session(s)... [0050]**

calendar information describing one or more events of a user (e.g., a scheduled flight, a work meeting, etc.)..." as taught in section [0046]), and

the method further comprises:

receiving, by the electronic device, a second command associated with a second application, from the user **(Brown: "please find my boarding pass" as displayed in Figure 11; item 1106) ;**

determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic command associated with the first application **(Brown: "...The smart device 102 may cause a conversation user interface to be presented on the smart device 102. The conversation user interface may enable a conversation between a user of the smart device 102..." as taught in section [0114] and as displayed in Figure 12; item 1202 and "...the smart device 102 may receive input from the user that selects a conversation item of the multiple conversation items and drags the selected conversation item to another conversation item of the multiple conversation items." As taught in section [0120] and as displayed in Figure 12; item 1306); and**

performing, by the electronic device, another action by executing the second command based on the context of the at least one historic command associated with the first application **("here is your boarding pass" as displayed in Figure 11, in that the action was to produce the boarding pass and the first command also deals with flight information).**

Brown fails to teach of the concept of the electronic device receiving a voice command from a user to perform at least one action and performing the action by executing the voice command based on the context of a historic voice command.

However Mauro teaches of the concept of the electronic device receiving a voice command from a user (“**the process determines whether input has been received. As noted above, input may be speech, typing/text, motion, or another format...**” as taught in section [0087] and as displayed in Figure 6; item 615) to perform at least one action (“... At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken.” As taught in section [0099] and as displayed in Figure 7; item 760 and as displayed in Figure 5B), based on the context of a historic voice command (“**When input is received at block 620 the process determines whether there is any context. Context is prior interactions, in the same session, which provide information used to interpret a request.**” As taught in section [0088], in that in order for the task to be executed (as displayed in Figure 7), the context first has to be determined (as displayed in Figure 6)).

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant’s invention for the electronic device receiving a voice command from a user to perform an action, based on the context of a historic voice command and while the historic command information of the Brown refers not necessarily to a speech input but to a touch input, the historic information of the Mauro pertains to the input speech (voice) command and thus would be combinable for the advantage of providing a device that can assist a user more efficiently as taught by Mauro (section [0023]).

Regarding Claim 7, Brown as modified by Mauro , above in Claim 6, continues to teach of, further comprising, in response to determining that there is no relationship between the

second voice command and the context of the at least one historic voice command associated with the first application **(Mauro: “If there is no context...” as taught in section [0088]);**

beginning a new context based on the second voice command **(Mauro: “...Context is prior interactions, in the same session, which provide information used to interpret a request. If there is no context, at block 625 a query is crated based on the input.” As taught in section [0088] and “create query based on input” as displayed in Figure 6; item 625);** and

performing, by the electronic device, at least one action by executing the second voice command based on the new context **(Mauro: “... At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken.” As taught in section [0099] and as displayed in Figure 7; item 760 and as displayed in Figure 5B).**

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant’s invention for in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application beginning a new context based on the second voice command performing, by the electronic device, at least one action by executing the second voice command based on the new context for the advantage of providing a device that can assist a user more efficiently as taught by Mauro **(section [0023]).**

Regarding Claim 8, Brown as modified by Mauro, above in Claim 1, continues to teach, the method, further comprising: determining whether the first voice command is for performing a search or an action **(Mauro: “...The process determines whether the input can be**

interpreted. An input can be interpreted if the query can be identified...” as taught in section [0088] and “Can input be interpreted?” as displayed in Figure 8); and

in response to determining that the first voice command is for performing a search (Mauro: “...At block 645, the process determines whether the query is complete. A query is complete if it can be executed without any additional information.” As taught in section [0090] and as displayed in Figure 6; item 645)), beginning a new context based on the first voice command (Mauro: “...Context is prior interactions, in the same session, which provide information used to interpret a request. If there is no context, at block 625 a query is created based on the input” as taught in section [0088]),

performing a search based on the first voice command, and presenting a result of the search based on the first voice command (Mauro: “...For example, if the user's query is "transactions on account X" the most recent transactions may be provided in order. The system may further display likely limits, e.g. "cleared" or "last 10" or "this month" etc. FIG. 5D illustrates one example of such a transaction summary showing the last five checks that cleared.” As taught in section [0108] and as displayed in Figure 5D).

Regarding Claim 9, Brown as modified Mauro, above in Claim 1, continues to teach of, wherein the at least one action is performed by executing the first voice command based on a most recent context (Mauro: “the query is stored in the history of successful queries. In one embodiment, the system maintains a store of successfully executed queries, in reverse historical order (e.g. most recent on the top).” As taught in section [0100] and as displayed in Figure 7; item 735 and “...This would enable the user to select the query for repetition,

rather than reentering the query and context. The process then ends at block 750.” As taught in section [0101]).

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant’s invention for the at least one action is performed by executing the first voice command based on a most recent context for the advantage of providing a device that can assist a user more efficiently as taught by Mauro (section [0023]).

Regarding Claims 10 - 18, recites a system version of Claims 1-9, please see rationale as applied above. In addition Brown as modified by Mauro continues to teach of an electronic device (Brown: “...For example, the smart device 102 may be implemented as a laptop computer, a desktop computer, a server, a smart phone, an electronic reader device, a mobile handset, a personal digital assistant (PDA)...” as taught in section [0029 and “device” as displayed in Figure 1; item 102) comprising an audio receiver and a processor (“ The smart device 102 may be equipped with one or more processors 106, memory 108, a display(s), a microphone(s), a speaker(s), a camera(s), a sensor(s), and a network interface(s)” as taught in section [0030] and as displayed in Figure 1).

Regarding Claim 19, Brown teaches of a method (as displayed in Figure 13)comprising:

receiving, by a mobile device (“...For example, the smart device 102 may be implemented as a... smart phone, an electronic reader device, a mobile handset, a personal digital assistant (PDA)...” as taught in section [0029]), a first command of a user (“...The

smart device 102 may cause a conversation user interface to be presented on the smart device 102. The conversation user interface may enable a conversation between a user of the smart device 102...” as taught in section [0114] and as displayed in Figure 12; item 1202 and “...the smart device 102 may receive input from the user that selects a conversation item of the multiple conversation items and drags the selected conversation item to another conversation item of the multiple conversation items.” As taught in section [0120] and as displayed in Figure 12; item 1306);

determining an intent of the user by parsing the first command (“...The context module 136 may take into account contextual information when determining an intent or meaning of a user's query...In some instances, by taking context into account in at least these locations, a response may be provided to a user that more closely emulates human-to-human interaction, in comparison to traditional techniques for identifying virtual assistant responses.” As taught in section [0044] and “...the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation.” As displayed in section [0115]);

matching the determined intent of the user with a pre-stored context of a previous user command (“The context module 136 may be configured to identify (e.g., determine) one or more pieces of contextual information. The context module 136 may take into account contextual information when determining an intent or meaning of a user's query. In addition, after identifying the user's intent with use of the context, the context module 136 may again take this context into account when determining a response or reply to provide back to the user.” As taught in section [0044]); and

performing, by the mobile device, a first action by executing the first command based on the matched context (“...In this example, the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform the requested task (e.g., check-in "0" bags)." As taught in section [0095] and as displayed in Figure 8) and “...the smart device 102 may cause the task to be performed by the virtual assistant. The task may be performed based at least in part on the input that is received from the user (e.g., the answer to the inquiry).” As taught in section [0121] and as displayed in Figure 13; item 1308).

Brown fails to teach of the concept of the mobile device receiving a voice command from a user to perform a first action based on the matched context.

However Mauro teaches of the mobile device receiving a voice command from a user (“the process determines whether input has been received. As noted above, input may be speech, typing/text, motion, or another format...” as taught in section [0087] and as displayed in Figure 6; item 615) to perform a first action based on the matched context to perform at least one action (“... At block 760, the process determines whether the user has confirmed. If so, at block 765, the instructions are sent to the application to execute based on the confirmed action taken.” As taught in section [0099] and as displayed in Figure 7; item 760 and as displayed in Figure 5B).

Therefore it would have been obvious to one of ordinary skill in this art at the time of the Effective Filing Date of the Applicant’s invention to have the mobile device receiving a voice

command from a user to perform a first action based on the matched context for the advantage of providing a device that can assist a user more efficiently as taught by Mauro (section [0023]).

Regarding Claim 20, Brown as modified by Mauro, above in Claim 19, continues to teach of, wherein the first voice command and the first action are associated with a first application executable by the mobile device (**Brown: “In this example, the user 104 has selected the item 802 at an initial position and is dragging the item 802 onto the item 804 to indicate that the user 104 will be checking "0" bags onto the flight. In response to receiving such input from the user 104, the virtual assistant 112 may perform the requested task (e.g., check-in "0" bags), and**

the method further comprises:

receiving, by the mobile device, a second voice command of the user (**Brown: “please find my boarding pass” as displayed in Figure 11; item 1106);**

determining the intent of the user by parsing the second voice command (“...**The context module 136 may take into account contextual information when determining an intent or meaning of a user's query...In some instances, by taking context into account in at least these locations, a response may be provided to a user that more closely emulates human-to-human interaction, in comparison to traditional techniques for identifying virtual assistant responses.” As taught in section [0044] and “...the smart device 104 may identify (e.g., determine) contextual information that is related to the conversation.” As displayed in section [0115]);**

matching the determined intent of the user with the pre-stored context of the previous user command and the first application (**“The context module 136 may be configured to identify (e.g., determine) one or more pieces of contextual information. The context module 136 may take into account contextual information when determining an intent or meaning of a user's query. In addition, after identifying the user's intent with use of the context, the context module 136 may again take this context into account when determining a response or reply to provide back to the user.” As taught in section [0044]); and**

executing the second voice command based on the matched context within the first application (**“here is your boarding pass” as displayed in Figure 11, in that the action was to produce the boarding pass and the first command also deals with flight information).**

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEARA HARRIS whose telephone number is (571)270-5479. The examiner can normally be reached on M-F, 9:30AM-5:30PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tammy Paige Goddard can be reached on 571-272-7773. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/KEARA HARRIS/
Examiner, Art Unit 2677

/TAMMY PAIGE GODDARD/
Supervisory Patent Examiner, Art Unit 2677

Notice of References Cited	Application/Control No. 15/429,715		Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.	
	Examiner KEARA HARRIS		Art Unit 2677	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2014/0258324 A1	09-2014	Mauro; David Andrew	G06F17/30392	707/766
*	B	US-2014/0317502 A1	10-2014	Brown; Fred A.	G06F9/453	715/706
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
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	I	US-				
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Search Notes 	Application/Control No. 15429715	Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.
	Examiner KEARA HARRIS	Art Unit 2677

CPC- SEARCHED		
Symbol	Date	Examiner
G10L15/22 or G10L15/063 or G10L15/1822 or G10L15/1815 or G10L2015/228 or G10L2015/223 or G10L2015/0635 or G10L15/065 or G10L15/07 or G10L15/20 or G10L2015/0631	03/29/2018	KH

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US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

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SEARCH NOTES		
Search Notes	Date	Examiner
Consulted SPE Tammy Pham	03/30/2018	KH

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/K.H./ Examiner.Art Unit 2677	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	15/429,715
	Confirmation Number	5067
	Filing Date	February 10, 2017
	First Named Inventor	Arunabha CHOUDHURY
	Art Unit	2658
	Examiner Name	DORVIL, RICHEMOND
Attorney Docket Number		Q231458

U.S. PATENTS						
Examiner Initials*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear

U.S. PATENT APPLICATION PUBLICATIONS						
Examiner Initials*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	20140258324	A1	2014-09-11	Mauro, et al.	
	2.	20150042587	A1	2015-02-12	Jung, et al.	
	3.	20130204622	A1	2013-08-08	Lu, et al.	
	4.	20150161997	A1	2015-06-11	Wetsel, et al.	
	5.	20140317502	A1	2014-10-23	Brown, et al.	

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	6.	International Search Report (PCT/ISA/210) dated May 25, 2017, issued by the International Searching Authority in counterpart International Patent Application No. PCT/KR2017/001495	
	7.	Written Opinion (PCT/ISA/237) dated May 25, 2017, issued by the International Searching Authority in counterpart International Patent Application No. PCT/KR2017/001495	

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Examiner Signature	/KEARA S HARRIS/	Date Considered	03/29/2018

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	Art Unit	2658
	Examiner Name	DORVIL, RICHEMOND
	Attorney Docket Number	Q231458

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☐ None			
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A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.			
Signature	/Christopher R. Lipp/	Date (YYYY-MM-DD)	2017-07-21
Name/Print	Christopher R. Lipp	Registration Number	41,157

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<i>Index of Claims</i> 	Application/Control No. 15429715	Applicant(s)/Patent Under Reexamination CHOUDHURY ET AL.
	Examiner KEARA HARRIS	Art Unit 2677

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant		☐ CPA		☐ T.D.		☐ R.1.47			
CLAIM		DATE							
Final	Original	03/30/2018							
	1	✓							
	2	✓							
	3	✓							
	4	✓							
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
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CONFIRMATION NO. 5067

PUBLICATION NOTICE

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037



OC000000093532567

Title:METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

Publication No.US-2017-0236513-A1

Publication Date:08/17/2017

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That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).			
☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.			
☒ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.			
☐ None			
WASHINGTON OFFICE 23373 CUSTOMER NUMBER			
SIGNATURE			
A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.			
Signature	/Christopher R. Lipp/	Date (YYYY-MM-DD)	2017-07-21
Name/Print	Christopher R. Lipp	Registration Number	41,157

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

[Page 2 of 2]

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P23040-PCT	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/KR2017/001495	International filing date (<i>day/month/year</i>) 10 February 2017 (10.02.2017)	(Earliest) Priority Date (<i>day/month/year</i>) 12 February 2016 (12.02.2016)
Applicant SAMSUNG ELECTRONICS CO., LTD.		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of :

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

- b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).
c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the **drawings** to be published with the abstract is Figure No. 9
☒ as suggested by the applicant.
☐ as selected by this Authority, because the applicant failed to suggest a figure.
☐ as selected by this Authority, because this figure better characterizes the invention.
b. ☐ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2017/001495**A. CLASSIFICATION OF SUBJECT MATTER****G10L 15/22(2006.01)i, G10L 15/08(2006.01)i, G06F 17/30(2006.01)i**

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G10L 15/22; G06F 3/0486; G06F 9/44; G06F 17/30; G06F 3/16; G06F 3/0354; G06F 17/28; G10L 15/08

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: voice command, context, application execution, history, and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2014-0258324 A1 (NUANCE COMMUNICATIONS, INC.) 11 September 2014 See paragraphs [0043]-[0044], [0088], [0099]; claim 9; and figures 6-7.	1-15
Y	US 2015-0042587 A1 (SAMSUNG ELECTRONICS CO., LTD.) 12 February 2015 See paragraphs [0067], [0070], and [0080]; and figure 5.	1-15
A	US 2013-0204622 A1 (WENHUI LU et al.) 08 August 2013 See paragraphs [0042]-[0047] and figure 2.	1-15
A	US 2015-0161907 A1 (LENOVO (SINGAPORE) PTE. LTD.) 11 June 2015 See paragraphs [0026]-[0037] and figure 3.	1-15
A	US 2014-0317502 A1 (NEXT IT CORPORATION) 23 October 2014 See paragraphs [0045]-[0080] and figures 1-2.	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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

"E" earlier application or patent but published on or after the international filing date

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

25 May 2017 (25.05.2017)

Date of mailing of the international search report

25 May 2017 (25.05.2017)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsu-ro, Seo-gu, Daejeon, 35208, Republic of Korea



Facsimile No. +82-42-481-8578

Authorized officer

NHO, Ji Myong

Telephone No. +82-42-481-8528



Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2017/001495

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014-0258324 A1	11/09/2014	None	
US 2015-0042587 A1	12/02/2015	EP 2835723 A1 KR 10-2015-0017977 A	11/02/2015 23/02/2015
US 2013-0204622 A1	08/08/2013	US 9224396 B2 WO 2011-151502 A1	29/12/2015 08/12/2011
US 2015-0161997 A1	11/06/2015	CN 104699236 A DE 102014117504 A1	10/06/2015 11/06/2015
US 2014-0317502 A1	23/10/2014	EP 2987164 A2 EP 2987164 A4 WO 2014-172054 A2 WO 2014-172054 A3	24/02/2016 19/04/2017 23/10/2014 08/10/2015

Form PCT/ISA/210 (patent family annex) (January 2015)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: LEE, Keon-Joo Mihwa Bldg., 16 Daehak-ro 9-gil Chongro-gu Seoul 03079 Republic of Korea		<h1 style="text-align: center;">PCT</h1> <p style="text-align: center;">WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY</p> <p style="text-align: center;">(PCT Rule 43bis.1)</p>	
		Date of mailing (day/month/year) 25 May 2017 (25.05.2017)	
Applicant's or agent's file reference P23040-PCT		FOR FURTHER ACTION See paragraph 2 below	
International application No. PCT/KR2017/001495	International filing date (day/month/year) 10 February 2017 (10.02.2017)	Priority date(day/month/year) 12 February 2016 (12.02.2016)	
International Patent Classification (IPC) or both national classification and IPC G10L 15/22(2006.01)i, G10L 15/08(2006.01)i, G06F 17/30(2006.01)i			
Applicant SAMSUNG ELECTRONICS CO., LTD.			
<p>1. This opinion contains indications relating to the following items:</p> <p>☒ Box No. I Basis of the opinion</p> <p>☐ Box No. II Priority</p> <p>☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>☐ Box No. IV Lack of unity of invention</p> <p>☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement</p> <p>☐ Box No. VI Certain documents cited</p> <p>☒ Box No. VII Certain defects in the international application</p> <p>☒ Box No. VIII Certain observations on the international application</p> <p>2. FURTHER ACTION</p> <p>If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.</p> <p>If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.</p> <p>For further options, see Form PCT/ISA/220.</p>			
Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578		Date of completion of this opinion 25 May 2017 (25.05.2017)	Authorized officer NHO, Ji Myong Telephone No. +82-42-481-8528

Form PCT/ISA/237 (cover sheet) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/KR2017/001495

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2017/001495

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-15	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-15	NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2014-0258324 A1 (NUANCE COMMUNICATIONS, INC.) 11 September 2014

D2: US 2015-0042587 A1 (SAMSUNG ELECTRONICS CO., LTD.) 12 February 2015

2.1 Novelty and Inventive Step

D1, which is considered to represent the most relevant state of the art to the subject matter of claims 1-15, discloses a task assistant system comprising (see claim 9):

an input user interface to receive input from a user through multimodal input including a plurality of speech input, typing input, and touch input (see claim 9);

a speech interpreter to determine a meaning of the input, the multimodal input interpreter including a session context store to determining whether there is a context based on prior interactions with the user (see claim 9); and

a command interpreter to generate an interpreted input based on a combination of the input and the context, and to provide a formatted query to the application (see claim 9), wherein the application receives the query to execute based on the confirmed action taken (see paragraph [0099] and figure 7).

2.1.1 Independent Claims 1 and 7

Claim 1 differs from D1 in that the electronic device comprises a processor configured to determine a relationship between the first voice command and a context of at least one historic voice command of the user. However, D2 discloses the features that a controller 110 may link read context or intention to data (a target object) generated by a pen touch input to configure context (at step 304 b of FIG. 5), then match the target object for which the context is configured with a predetermined context model, and store the result of the matching (at step 304 c of FIG. 5) (see paragraph [0067] and figure 5). Accordingly, it would be obvious to a person skilled in the art to apply said features of D2 to the task assistant system of D1 to arrive at the subject matter of claim 1.

Continued on Supplemental Box

Form PCT/ISA/237 (Box No. V) (January 2015)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/KR2017/001495

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Claims 9-10 and 15 contain both an electronic device and a method (PCT Rule 6.1(a)).

(Note: This written opinion has been established on the assumption that claims 9-10 and 15 refer to claim 7.)

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2017/001495

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The phrase "configured determine" of claim 3 is considered to be a typo for "configured to determine" (PCT Article 6).

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box No. V

Claim 7 relates to a method for performing voice based actions by an electronic device corresponding to the electronic device of claim 1. Accordingly, the same reasoning as in claim 1 could be applied to claim 7.

Therefore, claims 1 and 7 are novel under PCT Article 33(2), but lack an inventive step under PCT Article 33(3).

2.1.2 Dependent Claims 2-6 and 8-15

Claims 2-6 and 8-15 are directly or indirectly dependent on claims 1 and 7 respectively.

The additional feature of **claims 2 and 8** is merely a variation of the feature of D1 considering that when input is received at block 620 the process determines whether there is any context and if there is no context, at block 625 a query is created based on the input (see paragraph [0088] and figure 6).

The additional feature of **claims 3 and 11** can be easily conceived from the feature of D2 considering that the controller 110 may read predetermined context or intention based on the word, the sentence, or the keyword divided in a meaning unit, and link the pen input data to the read context or intention to configure context. Next, the controller 110 may match the pen input data for which the context is configured with a predetermined context model (see paragraph [0067]).

The additional feature of **claims 4 and 12** can be easily conceived from the feature of D2 considering that if the controller 110 determines that the current situation corresponds to the third context model (for example, “notify when details about expert knowledge can be acquired”), the controller 110 may create recommendation information corresponding to the third context mode (see paragraph [0080]).

The additional feature of **claims 5 and 13** can be easily conceived from the feature of D1 considering that when input is received at block 620 the process determines whether there is any context and if there is no context, at block 625 a query is created based on the input (see paragraph [0088] and figure 6).

Continued on The Next Page

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/KR2017/001495

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Previous Page

The additional feature of **claims 6 and 14** can be easily conceived from the feature of D2 considering that the controller 110 may determine that pen input data (for example, “binary search, sequential search”) has a word or a sentence including context or intention that is read as “knowledge to learn” (see paragraph [0070]).

The additional feature of **claim 9** can be easily conceived from the feature of D1 considering that command interpreter 258 uses data from session context store 252, which provides context data, to interpret the meaning of commands (see paragraph [0043]).

The additional features of **claims 10 and 15** can be easily conceived from the feature of D1 considering that whenever a command is successfully interpreted, context updater 254 updates the context so that subsequent commands utilize the up-to-date context information (see paragraph [0044]).

Accordingly, claims 2-6 and 8-15 would have been obvious over D1 in view of D2. Therefore, claims 2-6 and 8-15 are novel under PCT Article 33(2), but lack an inventive step under PCT Article 33(3).

2.2 Industrial Applicability

Claims 1-15 are industrially applicable under PCT Article 33(4).

Electronic Acknowledgement Receipt	
EFS ID:	29851880
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Christopher Robert Lipp/Thomas Hundley
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	21-JUL-2017
Filing Date:	10-FEB-2017
Time Stamp:	12:45:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231458IDSasfiled.pdf	50599	yes	4
			f203181f48734616904c5e9657bb721199f483b8		

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	4	
Warnings:					
Information:					
2	Other Reference-Patent/App/Search documents	Q231458RefISASearchReport.pdf	1251515	no	3
			18140630e6ce89a80f44ea6027cca7fde2e0711f		
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	Q231458RefISAWrittenOpinion.pdf	2133961	no	7
			0dec6a5febfae6ca090f0ddd5571a2573a7332e1		
Warnings:					
Information:					
Total Files Size (in bytes):			3436075		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2658

Confirmation No.: 5067

Examiner: DORVIL, RICHEMOND

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED
ACTIONS

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98**

MAIL STOP AMENDMENT

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed: (1) No later than three months from the application's filing date; (2) Before the mailing date of the first Office Action on the merits (whichever is later); or (3) Before the mailing date of the first Office Action after filing a request for continued examination (RCE) under §1.114, and therefore, no Statement

INFORMATION DISCLOSURE STATEMENT

UNDER 37 C.F.R. §§ 1.97 and 1.98

U.S. Appln. No.: 15/429,715

Attorney Docket No.: Q231458

under 37 C.F.R. § 1.97(e) or fee under 37 C.F.R. § 1.17(p) is required. However, since a Statement under 37 C.F.R. § 1.97(e) can be made, a Statement is submitted herewith.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Christopher R. Lipp/

SUGHRUE MION, PLLC

Telephone: 202.293.7060

Facsimile: 202.293.7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Date: July 21, 2017

Christopher R. Lipp

Registration No. 41,157



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY DOCKET NO	TOT CLAIMS	IND CLAIMS
15/429,715	02/10/2017	2658	1600	Q231458	20	3

CONFIRMATION NO. 5067

FILING RECEIPT



0000000089339636

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

Date Mailed: 02/22/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Arunabha CHOUDHURY, Bangalore, INDIA;
Sriram NAGASWAMY, Bangalore, INDIA;

Applicant(s)

SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF;

Assignment For Published Patent Application

SAMSUNG ELECTRONICS CO., LTD., Suwon-si, KOREA, REPUBLIC OF

Power of Attorney: The patent practitioners associated with Customer Number 23373

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
INDIA 201641004997 02/12/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/17/2017

page 1 of 3

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/429,715**

Projected Publication Date: 08/17/2017

Non-Publication Request: No

Early Publication Request: No

Title

METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

Preliminary Class

704

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/429,715			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720		
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *				x 80 =	0.00		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 = *				x 420 =	0.00		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00		
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00		
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	1600		
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	**	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	***	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	**	=		x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	***	=		x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.				TOTAL		TOTAL			
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".				ADD'L FEE		ADD'L FEE			
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".									
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



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PATENT OFFICE
MINISTRY OF COMMERCE AND INDUSTRY
Department of Industrial Policy and Promotion

It is hereby certified that annexed here to is a true copy of **Complete Specification, Abstract and Drawings** of the patent application as filed and as detailed below:-

Date Of Application : 12/02/2016
Date of filing of Complete Specification : 05/12/2016
Application No. : 201641004997
Applicant : M/s. Samsung R&D Institute India - Bangalore Private Limited, an Indian Company of #2870, Orion Building, Bagmane Constellation Business Park, Outer Ring Road, Doddanekundi Circle, Marathahalli Post, Bangalore-560037.

In witness there of
I have here unto set my hand

Dated this the 30th day of January 2017
10th day of Magha 1938(Saka)

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FORM 2

The Patent Act 1970

(39 of 1970)

&

The Patent Rules, 2005

**COMPLETE SPECIFICATION
(SEE SECTION 10 AND RULE 13)**

TITLE OF THE INVENTION

**“Method and electronic device thereof for performing voice based
actions”**

APPLICANTS:

Name : Samsung R & D Institute India -
Bangalore Private Limited

Nationality : Indian

Address : # 2870, Orion Building, Bagmane Constellation
Business Park, Outer Ring Road, Doddanekundi
Circle, Marathahalli Post, Bangalore-560037

The following specification particularly describes the invention and the
manner in which it is to be performed:-

1/40

2016A1004997-
12/02/2016

FIELD OF INVENTION

[0001] The present invention relates generally to electronic devices for retrieving information and more particularly, to a method and electronic device thereof for performing voice based actions. The present application is based on, and claims priority from an Indian Application
5 Number **201641004997** filed on **12th February, 2016**, the disclosure of which is hereby incorporated by reference herein.

BACKGROUND

[0002] Generally, as a means of accepting an input from a user, an electronic device utilizes a voice recognition system so as to recognize a
10 spoken utterance from user's, a speech vocabulary sequence from a user's voice, voice search, etc., and accept it as an input to the voice recognition system (i.e., the voice recognition system comprising the voice recognition unit) has been known. For example, information delivery systems including a voice portal, a navigation system, and a voice search to explore the
15 content of the one or more applications (supported by voice based search), etc.

[0003] For example, FIGS. 1a-1b illustrates an exemplary configuration (i.e., screen shot of the electronic device 100) performing one or more functionalities of the existing voice recognition system. The
20 existing voice recognition system may receive a user input (i.e., voice command/ voice query/ voice search query), in a voice based search application or any other application related thereof, the voice query such as; "Open Bluetooth". The voice recognition system in the electronic device 100 may process the voice query therethrough provide an output to the
25 voice query provided by the user. As shown in the FIG. 1a, based upon the voice query the "Bluetooth application" is enabled.

[0004] Further, if the user input(s) another voice query, such as "find nearby devices" the voice recognition system may process the voice

query therethrough and may provide an output to the another voice query. As shown in the FIG. 1b, based upon the another voice query the search application may start searching for the term “find nearby devices”, instead of searching/providing the lists of nearby devices by way of the Bluetooth application.

[0005] In another example as shown in FIG. 2a, if the user input(s) (i.e., voice command/ voice query/ voice search query), the user input (first query); “brightness”, the electronic device 100 may pop-up/display the “brightness slider” of the electronic device 100. Further, if the user inputs second voice query in order to perform any action related to the application (i.e., “the brightness”), the action such as “increase/up the “brightness level”, as shown in FIG. 2b. Then, the electronic device 100 results with no response to the action as requested by the user through the second voice query. Further, there is no support for brightness slider control, thus touch control has to be used.

[0006] In yet another example as shown in FIG. 3a, if the user inputs (i.e., first voice input/query, voice command/ voice query/ voice search query) in any of the e-commerce application or any other application related thereof. A first voice query; “white shoes” in the application. The electronic device 100 provides the lists of the “white shoes” available in the application to the user. Further, if the user inputs second user input, such as; “white sports and outdoor shoes” in the application thereto, the application may not provide the output as required by the user through the second user input, as shown in FIG 3b.

[0007] In yet another example as shown in FIG. 4a, if the user queries (i.e., first voice query) to open instant messaging (IM) application. The instant messaging application is opened and the voice search ends. Thus, if the user inputs second voice query, such as; “Alison”. The electronic device 100 (or, the associated IM application in the electronic

device 100) may fail, as shown in FIG. 4b, to fetch the conversation belonging to the "Alison" as requested by the user through the second voice query.

5 [0008] Yet another example as illustrated in FIGS 5a-5c, if the user queries (i.e., first query) the current application, with a term "go back" (for example, navigating back to the previously queried term/application). The current application may therefore start searching for the term "go back" instead of navigating back/going back to a previously queried term/application (if any).

10 [0009] Yet another example as illustrated in FIGS 6a-6b, the electronic device may not be able to automatically apply the search query and search filter of "X" application into a "Y" application, whenever the user launches the "Y" application while viewing a content in the "X" application. As a result, the user might have to repeat the search term (i.e.,
15 white shoes) and the filters (brand, size, etc.) applied to it, which is redundant.

[0010] Thus, it is evident with respect to the details provided in the aforesaid FIGS 1-6, the current voice search system or any other application related thereof, is restricted to one hop breadth search. The one
20 hop breadth search covers a wide range of topics/items. When the user searches for the item, the information corresponding to the item is retrieved and the search terminates at the result. Further, the electronic device (or, the voice recognition system) does not provide with a provision to the user in navigating back to the previously queried/explored item of the
25 application/or any other application related thereof.

[0011] Also, the disadvantage with the one hop search is that, the user interaction with the electronic device is a mixture of voice and touch. This is a major drawback. There is no means to navigate within the perspective of the result without switching from the voice to touch.

OBJECT OF INVENTION

[0012] The principal object of the embodiments herein is to provide a method and electronic device for performing voice based actions.

5 [0013] Another object of the embodiments herein is to provide a method for receiving a voice command from a user.

[0014] Another object of the embodiments herein is to provide a method for determining a relationship between the voice command and a context of at least one historic voice command of the user.

10 [0015] Another object of the embodiments herein is to provide a method for performing at least one action by executing the voice command based on the context.

[0016] Another object of the embodiments herein is to provide a method for receiving a first voice command associated with a first application from a user.

15 [0017] Another object of the embodiments herein is to provide a method for determining a relationship between the first voice command and a context of at least one historic voice command associated with the first application.

20 [0018] Another object of the embodiments herein is to provide a method for performing at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application.

25 [0019] Another object of the embodiments herein is to provide a method for receiving a second voice command associated with a second application from the user.

[0020] Another object of the embodiments herein is to provide a method for determining a relationship between the second voice command and the context of at least one historic voice command associated with the first application.

[0021] Another object of the embodiments herein is to provide a method for performing at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

5

SUMMARY

[0022] Accordingly embodiments herein provide a method for performing voice based actions by an electronic device. The method includes receiving a voice command from a user. Further, the method includes determining a relationship between the voice command and a context of at least one historic voice command of the user. Furthermore, the method includes performing at least one action by executing the voice command based on the context.

[0023] In an embodiment, the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.

[0024] In an embodiment, the context of the at least one historic voice command is dynamically update based on the relationship.

[0025] In an embodiment, the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarly, a latent semantic similarly, and an action performed by each of the historic voice command.

[0026] Accordingly embodiments herein provide yet another method for performing voice based actions by an electronic device. The method includes receiving a first voice command associated with a first application from a user. Further, the method includes determining a relationship between the first voice command and a context of at least one historic voice command associated with the first application. Further, the method includes performing at least one action by executing the voice command based on the context of at least one historic voice command

associated with the first application. Further, the method includes receiving a second voice command associated with a second application from the user, determining a relationship between the second voice command and the context of at least one historic voice command associated with the first application and performing at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0027] In an embodiment, the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.

[0028] In an embodiment, the context of the at least one historic voice command is dynamically update based on the relationship.

[0029] In an embodiment, the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarity, a latent semantic similarity, and an action performed by each of the historic voice command.

[0030] Accordingly embodiments herein provide an electronic device for performing voice based actions. The electronic device includes an audio unit configured to receive a voice command from a user, a context identification unit configured to determine a relationship between the voice command and a context of at least one historic voice command of the user and a processor configured to perform at least one action by executing the voice command based on the context.

[0031] Accordingly embodiments herein provide yet another electronic device for performing voice based actions. The electronic device includes an audio unit configured to receive a first voice command associated with a first application from a user, a context identification unit configured to determine a relationship between the first voice command and a context of at least one historic voice command associated with the

first application, a processor configured to perform at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application. Further, the audio unit configured to receive a second voice command associated with a second
5 application from the user, the context identification unit configured determine a relationship between the second voice command and the context of at least one historic voice command associated with the first application, and the processor configured to perform at least one action by executing the second voice command based on the context of at least one
10 historic voice command associated with the first application.

[0032] These and other aspects of the embodiments herein will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following descriptions, while indicating
15 preferred embodiments and numerous specific details thereof, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the embodiments herein without departing from the spirit thereof, and the embodiments herein include all such modifications.

20 **BRIEF DESCRIPTION OF FIGURES**

[0033] This method is illustrated in the accompanying drawings, throughout which like reference letters indicate corresponding parts in the various figures. The embodiments herein will be better understood from the following description with reference to the drawings, in which:

25 [0034] FIGS. 1a-1b illustrate an exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

[0035] FIGS. 2a-2b illustrate another exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

5 [0036] FIGS. 3a-3b illustrate yet another exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

[0037] FIGS. 4a-4b illustrate yet another exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

10 [0038] FIGS. 5a-5c illustrate yet another exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

[0039] FIGS. 6a-6b illustrate yet another exemplary configuration of an electronic device performing one or more functionalities of the existing voice recognition system, according to a prior art;

15 [0040] FIG. 7 illustrates various units of an electronic device configured to perform one or more voice based actions, according to an embodiment as disclosed herein;

[0041] FIG. 8 is an architecture of an electronic device configured to perform one or more voice based actions, according to an embodiment as disclosed herein;

[0042] FIG. 9 illustrates a flow diagram illustrating a method for performing the voice based actions by the electronic device, according to an embodiment as disclosed herein;

25 [0043] FIG. 10 illustrates a flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device 100, according to an embodiment as disclosed herein;

[0044] FIG. 11 illustrates yet another flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device, according to an embodiment as disclosed herein;

5 [0045] FIG. 12 is an example illustration of an electronic device performing the one or more voice based actions based on the relationship between the voice command and the context of the at least one historic voice command of the user, according to an embodiment as disclosed herein;

10 [0046] FIGS. 13a-13b illustrate a use case scenario in which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein;

 [0047] FIGS. 14a-14b illustrate another use case scenario in which a method is used to perform the one or more voice based actions in the
15 electronic device, according to an embodiment as disclosed herein;

 [0048] FIGS. 15a-15b illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein;

 [0049] FIGS. 16a-16b illustrate yet another use case scenario in
20 which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein;

 [0050] FIGS. 17a-17c illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein;

25 [0051] FIGS. 18a-18b illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein;

[0052] FIGS. 19a-19b illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device, according to an embodiment as disclosed herein; and

5 [0053] FIG. 20 illustrate a computing environment implementing the method and electronic device thereof for performing voice based actions, according to an embodiment as disclosed herein.

DETAILED DESCRIPTION OF INVENTION

[0054] The embodiments herein and the various features and advantageous details thereof are explained more fully with reference to the non-limiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. Also, the various embodiments described herein are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments. The term “or” as used herein, refers to a non-exclusive or, unless otherwise indicated. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein can be practiced and to further enable those skilled in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

[0055] Accordingly embodiments herein provide a method for performing voice based actions by an electronic device. The method includes receiving a voice command from a user. Further, the method includes determining a relationship between the voice command and a context of at least one historic voice command of the user. Furthermore, the method includes performing at least one action by executing the voice command based on the context.

[0056] Accordingly embodiments herein provide yet another method for performing voice based actions by an electronic device. The method includes receiving a first voice command associated with a first application from a user. Further, the method includes determining a relationship between the first voice command and a context of at least one historic voice command associated with the first application. Further, the method includes performing at least one action by executing the voice

command based on the context of at least one historic voice command associated with the first application. Further, the method includes receiving a second voice command associated with a second application from the user, determining a relationship between the second voice command and the context of at least one historic voice command associated with the first application and performing at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0057] Accordingly embodiments herein provide an electronic device for performing voice based actions. The electronic device includes an audio unit configured to receive a voice command from a user, a context identification unit configured to determine a relationship between the voice command and a context of at least one historic voice command of the user and a processor configured to perform at least one action by executing the voice command based on the context.

[0058] Accordingly embodiments herein provide yet another electronic device for performing voice based actions. The electronic device includes an audio unit configured to receive a first voice command associated with a first application from a user, a context identification unit configured to determine a relationship between the first voice command and a context of at least one historic voice command associated with the first application, a processor configured to perform at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application. Further, the audio unit configured to receive a second voice command associated with a second application from the user, the context identification unit configured to determine a relationship between the second voice command and the context of at least one historic voice command associated with the first application, and the processor configured to perform at least one action by

executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0059] Unlike the conventional method, the proposed method allows the electronic device to perform automatic context switching based on classification of a natural language query (i.e., without any specific voice command) to be one of a search and an action.

[0060] Unlike the conventional method, the proposed method allows the user to interact intuitively with the electronic device, a completely intangible interaction with the electronic device especially when hands are not free (example scenarios are while driving, cooking or exercising).

[0061] Unlike the conventional method, the proposed method allows the electronic device to not only perform the search for the item on the web application/ or any other application related thereof, but also aids in navigating the user, by way of the electronic device, by interacting with the electronic device using the natural language.

[0062] Unlike the conventional method, the proposed method allows the user with multi hop navigation and depth search as opposed to breadth search in most personal assistance software. The proposed method provides a complete Artificial intelligence (AI) based interaction between the user and the electronic device. Thus, providing a 2 dimensional (2D) voice search (i.e., multi-hop search, backward navigation, etc.) feature to the user.

[0063] Unlike conventional methods, in the proposed method, there is no notion of the electronic device for each state since number of possible states is infinite. Further, the proposed method obviates the necessity to explicitly specify the context by the user, thus making the search process convenient to the user.

[0064] Further, according to the conventional method, if the user queries “volume” to see current volume level, thereon, if the user wants to take volume level up/down. The user queries “volume up/down” each time to change volume level- up/down. Unlike the conventional method, in the proposed method, if the user queries “volume” to see current volume level. The volume slider launches and context (“volume”) is stored. The user only uses query “up/down” to take the volume up or down. The user can use keyword “up/down by five” instead of “volume up/down by five” each time.

[0065] Further, as in a conventional method, if the user queries “open browser” in Television (TV), thus, the browser opens in the TV. And, the user switches to remote for browsing. Unlike the conventional method, in the proposed method, the user queries “open browser” in the TV. The browser opens in the TV, and then the user browses using voice commands. The advantages of the proposed method are that, the voice assistance flow is now more intuitive, the user need not repeatedly use long queries since the most recent context is preserved. Navigating TV menu is much easier using voice commands as there is no need to memorize all menu items.

[0066] Referring now to the drawings, and more particularly to FIGS. 7 through 20, these are shown preferred embodiments.

[0067] FIG. 7 illustrates an electronic device 100 for performing one or more voice based actions, according to the embodiments as disclosed herein.

[0068] Referring to the FIG. 7, the electronic device 100 may be, for example, a mobile device, a wearable device, a laptop computer, a desktop computer, a smart television, a smart display, a notebook computer, a notebook, a tablet or a mobile device such as a mobile phone, internet of things (IoT), portable media player such as personal music

player and personal video player, or any consumer electronic devices capable of transmitting and receiving voice, text, audio, speech, image, or video data. Other forms of data processing device are within the scope of the exemplary embodiments discussed herein.

5 [0069] The electronic device 100 includes an audio unit 110, a voice search unit 120 comprising a context identification unit 126, a processor 130 (for example; a hardware unit, an apparatus, a Central Processing Unit (CPU), a Graphics Processing Unit (GPU)) communicatively coupled to the audio unit 110, a query construction unit
10 140, a display unit 150 (e.g., a Cathode Ray Tube (CRT) display, a Liquid Crystal Display (LCD)), a Light-emitting diode (LED) being interfaced with the processor 130, a memory unit 160 (e.g., a volatile memory and/or a non-volatile memory) communicatively coupled to the processor 130; the memory unit 160 includes storage locations configured to be addressable
15 through the processor 130, a knowledge based unit 170 and a communication unit 180.

 [0070] To overcome the problems discussed in the background section herein, the proposed method can allow a user to input a voice query (i.e., search query, voice command, etc.) through the user own speech/
20 utterance and conveniently receive search result data including text, audio, speech, image and video data.

 [0071] The audio unit 110 may include for example, voice recognition system, voice recognition unit, etc. The audio unit 110 may receive the voice command from the user. The voice command may include
25 for example, an utterance, a voice note, voice speech, a voice text, etc. A speech to text unit may be configured to convert the voice command from speech to text format. Further, the outputted text format from the speech to text unit is transmitted to a Query parser unit.

5 [0072] The voice search unit 120 includes a Natural Language Understanding (NLU) engine and a knowledge base engine. The NLU engine receives the parsed query from the Query parser unit. Further, the NLU engine classifies the parsed query based on the type of query (search, retrieve or perform another action) and identifies the context of the query. Further, the NLU engine transmit the identified context to the knowledge base engine. The knowledge base engine maps the identified action word to an actual action based on the context of the query.

10 [0073] The context identification unit 126 is configured to determine the relationship between the voice command and the context of at least one historic voice command of the user. The relationship is determined based on the at least one of the semantic similarity, a latent semantic similarity, and the action performed by each of the historic voice command. The actions stored in the memory unit 160, which are executed
15 by the processor 130 by executing the historic voice command.

[0074] The processor 130 is configured to perform the at least one action by executing the voice command based on the context.

20 [0075] The query construction unit 140 translates (if required) the NLU command of the user to a machine understandable format to produce the required results.

25 [0076] In another embodiment, the audio unit 110 is configured to receive the first voice command associated with the first application from the user, the context identification unit 126 is configured to determine the relationship between the first voice command and the context of at least one historic voice command associated with the first application and the processor 130 is configured to perform the at least one action by executing the voice command based on the context of the at least one historic voice command associated with the first application.

[0077] Further, the audio unit 110 is configured to receive the second voice command associated with the second application from the user, the context identification unit 126 is configured to determine the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, and the processor 130 configured to perform the at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0078] For example, the proposed method allows the user to switch the search application along with the provided item, and thus circumvent the user to provide another voice query in order to perform the action/search in the switched search application, as detailed in FIGS. 19a-19b.

[0079] FIG. 8 is an architecture of the electronic device 100 configured to perform one or more voice based actions, according to an embodiment as disclosed herein.

[0080] The audio unit 110 comprises a speech to text unit 112 configured to convert the voice command (received from the user) into the written word/statement. Further, the audio unit 100 comprises a query parser unit 114 configured to translate a search string (i.e., written instructions received from the speech to text unit 112) into specific instructions for the query constructor unit 140 to perform.

[0081] The query constructor unit 140 comprises a query generator 142, a query transmitter 144, and a result processing unit 146. The query generator 142 translates (if required) current query to a machine understandable format using the context information. The query transmitter 144 transmits the translated query (in case of a search) to the result processing unit 146. The result processing unit 146 accumulates results/outputs based on the translated query as gathered from the network.

[0082] Voice search unit 120 includes the NLU engine and a knowledge base engine. The NLU engine receives the parsed query from an automatic query parser 122. The automatic query parser 122 is configured to parse the query automatically. Further, the NLU engine classifies the
5 parsed query based on the type of query (search, retrieve or perform another action) and identifies the context of the query. Further, the NLU engine transmit the identified context to the knowledge base engine. The knowledge base engine maps the identified action word to an actual action based on the context of the query.

10 [0083] Binary classifier 124 is to classify the current command as action or comment.

[0084] Context identification unit 126 configured to determine the relationship between the voice command and the context of at least one historic voice command of the user. The relationship is determined based
15 on the at least one of the semantic similarity, a latent semantic similarity, and the action performed by each of the historic voice command. The actions stored in the memory unit 160, which are executed by the processor 130 by executing the historic voice command.

[0085] Knowledge base unit 170 maps the identified action word to
20 an actual action based on the context of the query

[0086] Action mapper 172 includes a set of actions, associated with a particular command, to be performed. Based on the command identified a particular action will be chosen.

[0087] FIG. 9 illustrates a flow diagram 900 illustrating a method
25 for performing the voice based actions by the electronic device 100, according to an embodiment as disclosed herein.

[0088] Referring to the FIG. 9, at step 902, the electronic device 100 receives the voice command from the user. For example, in the

electronic device 100, as illustrated in the FIG. 7, the audio unit 110 receives the voice command from the user.

[0089] At step 904, the electronic device 100 determines the relationship between the voice command and the context of at least one historic voice command of the user. For example, the context identification unit 126 determines the relationship between the voice command and the context of at least one historic voice command of the user. If the electronic device 100 determines the relationship then, at step 906, the electronic device 100 performs the at least one action by executing the voice command based on the context. For example, in the electronic device 100, as illustrated in the FIG. 7, the processor 130 performs the at least one action by executing the voice command based on the context.

[0090] If the electronic device 100 determines that there is no relationship (i.e., match) found between the voice command and the context of the at least one historic voice command of the user, at step 908, the electronic device 100 begins a new context thereupon, and stores it accordingly. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 begins the new context and stores it accordingly. At step 910, the electronic device 100 performs the at least one action by executing the voice command based on the new context. For example, in the electronic device 100, as illustrated in the FIG. 7, the processor 130 performs the at least one action by executing the voice command based on the context.

[0091] The various actions, acts, blocks, steps, etc., as illustrated in the FIG. 9 may be performed in the order presented, in a different order, or simultaneously. Further, in some embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure.

[0092] FIG. 10 illustrates a flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device 100, according to an embodiment as disclosed herein.

5 [0093] Referring to the FIG. 10, at step 1002 the electronic device 100 receives the first voice command associated with the first application from the user. For example, in the electronic device 100, as illustrated in the FIG. 7, the audio unit 110 receives the first voice command associated with the first application from the user.

10 [0094] At step 1004, the electronic device 100 determines the relationship between the first voice command and the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 determines the relationship between the first
15 voice command and the context of the at least one historic voice command associated with the first application.

[0095] If the electronic device 100 determines that there exists the relationship between the first voice command and the context of the at least one historic voice command associated with the first application, then, at
20 step 1006 the electronic device 100 performs the at least one action by executing the voice command based on the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, as illustrated in the FIG. 7, the processor 130 performs the at least one action by executing the voice command based on
25 the context of the at least one historic voice command associated with the first application.

[0096] If the electronic device 100 determines that there is no relationship between the between the first voice command and the context of the at least one historic voice command associated with the first

application, then at step 1008 the electronic device 100 begins the new context associated with the first application. Further, at step 1010 the electronic device 100 performs the at least one action by executing the voice command based on the new context.

5 [0097] At step 1012, the electronic device 100 receives the second voice command associated with the second application from the user. For example, in the electronic device 100, as illustrated in the FIG. 7, the audio unit 110 receives the second voice command associated with the second application from the user. At step 1014, the electronic device
10 100 determines if there exists any relationship between the second voice command and the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 determines if there is exists any relationship between the second voice
15 command and the context of the at least one historic voice command associated with the first application.

 [0098] If the electronic device 100 determines that there exists the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, then
20 at step 1016, the electronic device 100 performs the at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application. For example, in the electronic device 100, as illustrated in the FIG. 7, the processor 130 performs the at least one action by executing the second voice command
25 based on the context of at least one historic voice command associated with the first application.

 [0099] If the electronic device 100 determines that there exists no relationship(s) between the second voice command and the context of the at least one historic voice command associated with the first application, then

at step 1018, the electronic device 100 begins a new context associated with the second application. Further, at step 1020 the electronic device 100 perform the at least one action by executing the voice command based on the new context associated with the second application.

5 [00100] The various actions, acts, blocks, steps, etc., as illustrated in the FIG. 10 may be performed in the order presented, in a different order, or simultaneously. Further, in some embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure.

10 [00101] FIG. 11 illustrates yet another flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device 100, according to an embodiment as disclosed herein.

15 [00102] Referring to the FIG. 11, at step 1102 the electronic device 100 receives the voice query from the user. For example, in the electronic device 100, as illustrated in the FIG. 7, the audio unit 110 receives the voice query from the user.

20 [00103] At step 1104, the electronic device 100 construct the query by processing speech to text mechanism. For example, in the electronic device 100, as illustrated in the FIG. 7, the speech to text unit 112 constructs the query by processing speech to text mechanism

 [00104] At step 1106, the electronic device 100 runs the search action classifier. For example, in the electronic device 100, as illustrated in the FIG. 7, the binary classifier 124 runs the search action classifier.

25 [00105] At step 1108, the electronic device 100 determines whether the query is to perform search or to perform the action. For example, in the electronic device 100, as illustrated in the FIG. 7, the binary classifier 124 determines whether the query is the search or the action. For example, as illustrated in FIG. 12, the search can include “launching of related

application” as per the user voice command (i.e., open word, the electronic device 100 may launch the word application). Further, as illustrated in FIG. 12, the action can include “paste the first two sentence” as per the user voice command (i.e., paste first two sentence, the electronic device 100 may paste the first two sentence).

[00106] If the electronic device 100 determines the query as the search, then, at step 1110 the electronic device 100 begins a new context while considering the query as the search. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 begins the new context, as detailed in conjunction with FIGS. 19a-19b.

[00107] At step 1112, the electronic device 100 performs the search using the search query. For example, in the electronic device 100, as illustrated in the FIG. 7, the Voice search unit 120 performs the search using the search query.

[00108] At step 1114, the electronic device 100 provides results related to the search query. For example, in the electronic device 100, as illustrated in the FIG. 7, the result processing unit 146 provides results related to the search query.

[00109] If the electronic device 100, at step 1108, determines the query as the “Action”, then, at step 1116, the electronic device 100 further determines whether the results related to the action is in the context (for example, in the context of the voice query) or not. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 determines whether the results related to the search query are in the context or not.

[00110] If the electronic device 100 determines the results related to the voice query/action is in the context, then, at step 1118, the electronic device 100 retrieves the most recent context. For example, in the electronic

device 100, as illustrated in the FIG. 7, the context identification unit 126 retrieves the most recent context.

[00111] If the electronic device 100 determines the results related to the search query are not in the context, then, at step 1120, the electronic device 100 begins a new context. For example, in the electronic device 100, as illustrated in the FIG. 7, the context identification unit 126 begins a new context.

[00112] At step 1122, the electronic device 100 maps the raw action query to the standard action after beginning the new context or after getting the most recent context. For example, in the electronic device 100, as illustrated in the FIG. 7, the Knowledge base unit 170 maps the raw action query to the standard action.

[00113] At step 1124, the electronic device 100 performs action on the most recent context. For example, in the electronic device 100, as illustrated in the FIG. 7, the Action mapper 172 performs action on the most recent context.

[00114] At step 1126, the electronic device 100 provides the results. For example, in the electronic device 100, as illustrated in the FIG. 7, the result processing unit 146 provides the results.

[00115] The various actions, acts, blocks, steps, etc., as illustrated in the FIG. 10 may be performed in the order presented, in a different order, or simultaneously. Further, in some embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure

[00116] The FIG. 12 is an example illustration of the electronic device 100 performing the one or more voice based actions based on the relationship between the voice command and the context of the at least one historic voice command of the user, according to an embodiment as disclosed herein.

[00117] Referring to the FIG. 12, the user commence with a user input (i.e., voice query/ voice input query) through a voice command 1202, such as: “copy first 5 sentences” from an application 1214 currently rendered on a display unit 1230 (similar to the display unit 150). The context “first 5 sentences” is been stored by the memory unit 160 coupled to the context identification unit 126. The application 1214 may be any application having the capability of displaying/providing the content/item therein. The audio unit 110 may receive the voice command 1202 and may communicate an output (output such as; converting the voice command 1202 from speech to text and the query parser unit 114 to interpret and execute the voice command 1202) to the processor 130 coupled to the context identification unit 126.

[00118] Further, the user may provide a voice command 1204 to the electronic device 100(i.e., received by the audio unit 110), the voice command 1204, such as; “Open Word”. The context identification unit 126 may perform latent semantic analysis (LSA) from a corpus of words and supported commands to find the most relevant command that the user might have intended to use. The most relevant applications (for example, a word application 1216 may be launched by the electronic device 1200). Some commands may not exist on their own.

[00119] The context identification unit 126 determines the relationship between the voice command 1204 and the context of the least one historic voice command of the user, the historic voice command, herein can be, for example; the voice command 1202 and the context (for example, “copy first 5 sentences” and application 1214) associated with the voice command 1202 in a context cache (or, for example, related context saved in the memory unit 160).

[00120] The processor 130 may perform the action based on the context, the action such; as launching of the word application/document

1216 and displaying thereof by the display unit 1230. The context (for example, may now include “copy first 5 sentences”, “application 1202, “open word” and the application 1216) is stored in the memory unit 160.

5 [00121] The user may, further, provide a voice command 1206 to the electronic device 100(i.e., received by the audio unit 110), the voice command 1206, such as; “Paste first two sentence” while the application 1216 is in active state. The context identification unit 126 may determine the relationship between the voice command 1206 and the context of the at least one historic voice command, for example, context associated with the
10 voice command 1202 and the voice command 1204.

[00122] Thus, the processor 130 may perform the action by executing the voice command 1206. The action such as, “paste the first two sentences” into the “application 1206”. The context associated with the voice command 1206 may include “paste the first two sentences”, the
15 “application 1206”.

[00123] The user yet again, may provide a voice command 1208 to the electronic device 100(i.e., received by the audio unit 110), the voice command 1208, such as; “Open Note”. The context identification unit 126 may determine the relationship between the voice command 1208 and the
20 context associated with the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, and the voice command 1206.

[00124] Thus, the processor 130 may perform the action by executing the voice command 1208. The action such as, “opening of the note application 1218”. The context associated with the voice command
25 1208 may include “open note” and the “note application 1218”.

[00125] Further, the user may provide a voice command 1210 to the electronic device 100(i.e., received by the audio unit 110), the voice command 1210, such as; “Paste last three sentences” while the application

1218 is in the active state. The context identification unit 126 may determine the relationship between the voice command 1210 and the context of the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, the voice command 1206, and the voice command 1208.

[00126] Thus, the processor 130 may perform the action by executing the voice command 1210. The action such as, “pasting the last three sentences” in the note application 1218. The context associated with the voice command 1210 is “paste last three sentences” and the “note application 1218” is stored in the memory unit 160.

[00127] In another embodiment, of the example herein, the user may provide a voice command 1212 to the electronic device 100(i.e., received by the audio unit 110), the voice command 1212, such as; “Go back to word”. The context identification unit 126 may determine the relationship between the voice command 1212 and the context of the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, the voice command 1206, the voice command 1208, and the voice command 1210.

[00128] Based on the context, the processor 130 may perform the action, the action such as; navigating back to the word application 1216.

[00129] In an embodiment, the context identification unit 126 may perform latent semantic analysis (LSA) from a corpus of words and supported commands to find the most relevant command that the user might have intended to use. For example, if the voice command is start “application”. Thus, the context identification unit 126 may analyze the voice command 1204 and may search the most relevant application using the LSA, as the supported command in the voice command may be open/launch the application. Further, some commands cannot exist one their own. A previous command is necessary to set the context for these

commands. The processor 130 may contain a set of rules that will define these parasitic commands and their context search. For example, "Paste" command can only exist if there is a preceding "Copy" command. The rule here would be to search for the most recent "Copy" command in the context cache (or, for example, stored in the memory unit 160), "Close" command has to be preceded by the "Open" command. The rule here would be to search for the most recent open command in the context cache. "Go back" command without any context should automatically point to the most recent stored context. "Resume" command has to be preceded by a "pause" command. The rule here would be to search for the most recent pause.

[00130] FIGS. 13a-13b illustrates another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

[00131] Unlike the conventional method as discussed in the FIGS. 1a-1b (background), if the user, by way of proposed method, queries "Open Bluetooth" to connect to another electronic device. Bluetooth is opened (as shown in the FIG. 13a) and context ("Bluetooth") is stored. Further, the user queries "list nearby devices" to get a list of nearby electronic devices (as shown in the FIG. 13b). A list of the nearby electronic device is shown and the context is changed to ("Bluetooth", "list of nearby devices").

[00132] FIGS. 14a-14b illustrate yet another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

[00133] Unlike the conventional method as discussed in the FIGS. 2a-2b (background), if the user, by way of proposed method, queries "Brightness" to open brightness slider (as shown in the FIG. 14a) and context ("Brightness") is stored. Further, the user queries "up/down" to

change the level of the brightness in the brightness slider (as shown in the FIG. 14b) and the context is changed to (“Brightness”, “up/down”).

[00134] FIGS. 15a-15b illustrates yet another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

[00135] Unlike the conventional method as discussed in the FIGS. 3a-3b (background), if the user queries 1502, by way of proposed method, “find white shoes” in the application 1506. The electronic device 100 may provide, the user, with lists of the “white shoes” available in the application 1506 (as shown in the FIG. 15a). Further, if the user queries 1504, by way of proposed method, “find white sports shoes and outdoor shoes” in the application 1506 therefor, using the context identification unit 126, identifies the relationship between the voice command (user queries 1504) and the context (“white shoes”) of at least one historic voice command (i.e., user queries 1502). Thus, the processor 130 performs the at least one action by executing the voice command (user queries 1504) based on the context. The action, such as providing the lists of “white shoes” under the category of outdoor (as shown the FIG. 15b). The context identification unit 126 may change the context to (“white shoes” and “outdoor shoes”).

[00136] FIGS. 16a-16b illustrates yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

[00137] Unlike the conventional method as discussed in the FIGS. 4a-4b (background), if the user queries 1602, by way of proposed method an instant messaging (IM) application 1606. The IM application 1606 is opened and context (“IM”) is stored in the memory unit 160. The user queries 1604 “show chat from Alison”. The context identification unit 126

identifies the relationship between the voice command (user queries 1604) and the context ("IM") of at least one historic voice command (i.e., user queries 1602). Thus, the processor 130 performs the at least one action by executing the voice command (user queries 1604) based on the context.

5 The action, such the chat window for "Alison" is opened and context is changed to ("Instant Messaging", "chat from X").

[00138] Further, by way of the proposed method, if the user queries "Open Gallery". The gallery is opened and context ("gallery") is stored. The user queries "show album". Album window for "Alison" is opened and
10 context is changed to ("Gallery", "Album").

[00139] FIGS. 17a-17c illustrates yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

15 [00140] Unlike the conventional method as discussed in the FIGS. 5a-5c (background), if the user queries 1702, "find shoes in "X" source application 1708 as shown in the FIG. 17a), the processor 130 may perform the action by executing the user query 1702 and may display the result (i.e., shoes in X source) on a display unit 1712 (i.e., display unit 150). The
20 context "shoes in X" is stored in the memory unit 160. Further, if the user queries 1704, "Go to "Y" application 1710 (as shown in the FIG. 17b), the processor 130 may perform the action by executing the user query 1704. Furthermore, if the user queries 1706, "Go back", the context identification unit 126 may determine the relationship between the user query 1706 and
25 the at least one context of the historic voice command (i.e., voice query 1702 and voice query 1704), thus, the processor 130 may perform the action by executing the user query 1706, the action such as; navigating back to the application 1708 (as shown in the FIG. 17c).

[00141] FIGS. 18a-18b illustrates yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

5 [00142] In an example scenario, considering the conventional systems, if the user while driving wants to go to nearby Chinese restaurant. The user is not sure and wants to see the available options. The user queries “find Chinese restaurant nearby”. No result is returned, since navigation application can only navigate to specific locations. Unlike such
10 conventional scenarios, in the proposed method, a list of Chinese restaurant in text is returned in response to the user query 1802 from an application 1806 and displayed by the display unit 1810 (similar to the display unit 150) thereof. The context “Chinese restaurant nearby” is stored in the memory unit 160. The user likes restaurant “X” and queries (i.e., voice
15 command 1804) “take me to X”. The context identification unit 126 determines the relationship between the voice command 1804 and the context associated with the voice command 1804. The processor 130, in response to the relationship determined, may trigger launch the application 1808 to navigate the user to the direction corresponding to “X” restaurant
20 from current location of the user.

[00143] FIGS. 19a-19b illustrates yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to the embodiments as disclosed herein.

25 [00144] Unlike the conventional method as discussed in the FIGS. 6a-6b (background), the processor 130 can therefore switch the application 1906 (i.e., multiple sources) based on the context of the at least one historic voice command/ queries provided by the user. For example, the audio unit 110 may receive a first voice command 1902 with a context “show white

shoes with X source (1906). Further, the audio unit 130 may receive a second voice query for applying filters (i.e., size, brand, etc.), the context identification unit 126 may determine a relationship between the second voice command and the context of the first voice command 1902 associated with the application 1906. The processor 130 may execute the first voice command 1902 and display the result obtained therefrom the X source 1906 accompanying with the filters applied within the window (i.e., User Interface) of the X source.

[00145] Further, while the user currently viewing the results of first voice command 1902 within the window of the X source thereof the user may provide a third voice command 1904 with a context “show white shoes in Y source (1908), the context identification unit 126 may determine a relationship between the third voice command 1904 and a context of the at least the first voice command 1902 and the second voice command associated with the first application 1906. For example, context the term “show” is in relation with the first voice command 1902 and the third voice command 1904.

[00146] The processor 130 may execute the third voice command 1904 with the applied filter (as provided by way of the second voice command) in the Y source 1908 and display the result obtained therefrom the Y source 1908 within the window (i.e., User Interface) of the Y source. Thus, obviating the user to input a new voice query related to the voice query 1902 along with the filters associated therewith. Thus, the queries can be used over multiple sources.

[00147] Further, in the present scenario, the user queries using voice. The search results are returned in the form of a list. The user uses touch to explore the options. The limitation however is that user thought sequence is difficult to capture. Unlike such conventional scenarios, in the proposed method, the user queries using voice. The search results are

returned in the form of a list. The user uses voice depth search to explore. The advantages of the proposed method are that user's thoughts are captured in the form of text which can be used for sequence pattern mining and association rule mining.

5 [00148] FIG. 20 illustrates a computing environment 2000
implementing the method and electronic device 100 thereof for performing
voice based actions, according to an embodiment as disclosed herein. As
depicted in the figure 20, the computing environment 2000 comprises at
least one processing unit 2004 that is equipped with a control unit 2002 and
10 an Arithmetic Logic Unit (ALU) 2006, a memory 2008, a storage unit
2010, plurality of networking devices 2014, and a plurality Input output
(I/O) devices 2012. The processing unit 2004 is responsible for processing
the instructions of the schemes. The processing unit 2004 receives
commands from the control unit 2002 in order to perform its processing.
15 Further, any logical and arithmetic operations involved in the execution of
the instructions are computed with the help of the ALU 2006.

 [00149] The overall computing environment 2000 can be composed
of multiple homogeneous or heterogeneous cores, multiple CPUs of
different kinds, special media and other accelerators. The processing unit
2004 is responsible for processing the instructions of the schemes. Further,
20 the plurality of processing units 2004 may be located on a single chip or
over multiple chips.

 [00150] The scheme comprising of instructions and codes required
for the implementation are stored in either the memory unit 2008 or the
storage 2010 or both. At the time of execution, the instructions may be
25 fetched from the corresponding memory 2008 or storage unit 2010, and
executed by the processing unit 2004.

 [00151] In case of any hardware implementations various
networking devices 2014 or external I/O devices 2012 may be connected to

the computing environment to support the implementation through the networking unit and the I/O device unit.

[00152] The embodiments disclosed herein can be implemented through at least one software program running on at least one hardware
5 device and performing network management functions to control the elements. The elements shown in the FIGS. 7 through 20 include blocks which can be at least one of a hardware device, or a combination of hardware device and software units.

[00153] The foregoing description of the specific embodiments will
10 so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents
15 of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit
20 and scope of the embodiments as described herein.

STATEMENT OF CLAIMS

We claim:

1. A method for performing voice-based actions by an electronic device, the method comprising:
 - receiving, by the electronic device, a voice command from a user;
 - determining, by the electronic device, a relationship between the voice command and a context of at least one historic voice command of the user; and
 - performing, by the electronic device, at least one action by executing the voice command based on the context.
2. The method of claim 1, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.
3. The method of claim 1, wherein the context of the at least one historic voice command is dynamically update based on the relationship.
4. The method of claim 1, wherein the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarity, a latent semantic similarity, and an action performed by each of the historic voice command.
5. A method for performing voice-based actions by an electronic device, the method comprising:
 - receiving, by the electronic device, a first voice command associated with a first application from a user;
 - determining, by the electronic device, a relationship between the first voice command and a context of at least one historic voice command associated with the first application;

performing, by the electronic device, at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application;

receiving, by the electronic device, a second voice command associated with a second application from the user;

determining, by the electronic device, a relationship between the second voice command and the context of at least one historic voice command associated with the first application; and

performing, by the electronic device, at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

6. The method of claim 5, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.
7. The method of claim 5 wherein the context of the at least one historic voice command is dynamically update based on the relationship.
8. The method of claim 5, wherein the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarity, a latent semantic similarity, and an action performed by each of the historic voice command.
9. An electronic device for performing voice-based actions, the electronic device comprising:
 - an audio unit configured to receive a voice command from a user;
 - a context identification unit configured to determine a relationship between the voice command and a context of at least one historic voice command of the user; and
 - a processor configured to perform at least one action by executing the voice command based on the context.

10. The electronic device of claim 9, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.
11. The electronic device of claim 9, wherein the context of the at least one historic voice command is dynamically update based on the relationship.
12. The electronic device of claim 9, wherein the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarity, a latent semantic similarity, and an action performed by each of the historic voice command.
13. An electronic device for performing voice-based actions, the electronic device comprising:
- an audio unit configured to receive a first voice command associated with a first application from a user;
 - a context identification unit configured to determine a relationship between the first voice command and a context of at least one historic voice command associated with the first application;
 - a processor configured to perform at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application;
 - the audio unit configured to receive a second voice command associated with a second application from the user;
 - the context identification unit configured determine a relationship between the second voice command and the context of at least one historic voice command associated with the first application; and
 - the processor configured to perform at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

14. The electronic device of claim 13, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.
15. The electronic device of claim 13, wherein the context of the at least one historic voice command is dynamically update based on the relationship.
16. The electronic device of claim 13, wherein the relationship between the voice command and the context of the at least one historic voice command is determined based at least one of a semantic similarity, a latent semantic similarity, and an action performed by each of the historic voice command.

Dated: 5th Day of December, 2016



Signature

Arun Kishore Narasani

Patent Agent

ABSTRACT

Method and electronic device thereof for performing voice based actions

Embodiments herein provide a method performing voice-based actions by an electronic device. The method receiving, by the electronic device, a voice command from a user. Further, the method includes determining, by the electronic device, a relationship between the voice command and a context of at least one historic voice command of the user. Furthermore, the method includes performing, by the electronic device, at least one action by executing the voice command based on the context.

FIG.11

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Private Limited

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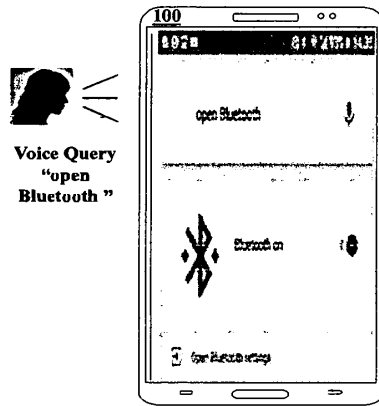


FIG. 1A
(Prior art)

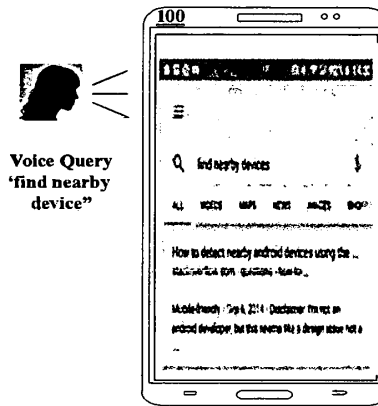


FIG. 1B
(Prior art)

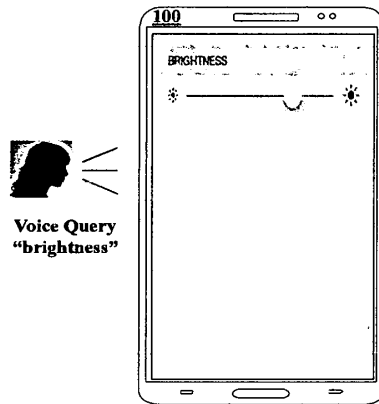


FIG. 2A
(Prior art)

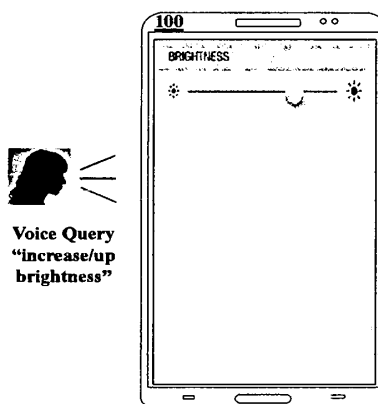


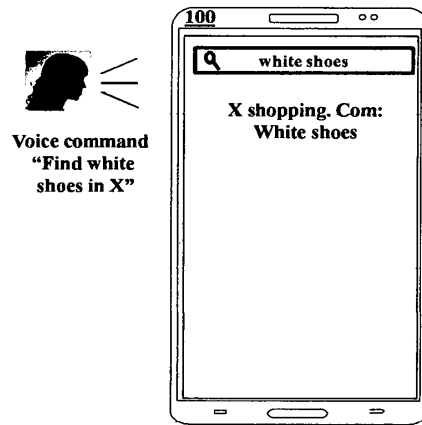
FIG. 2B
(Prior art)

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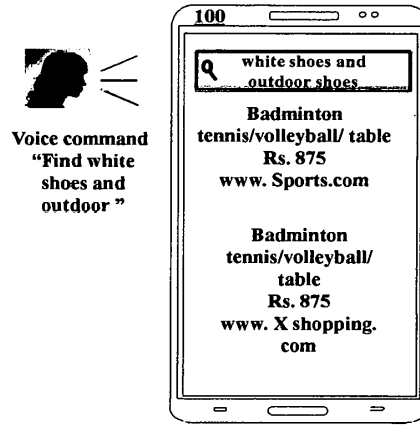
Application Number: 201641004997

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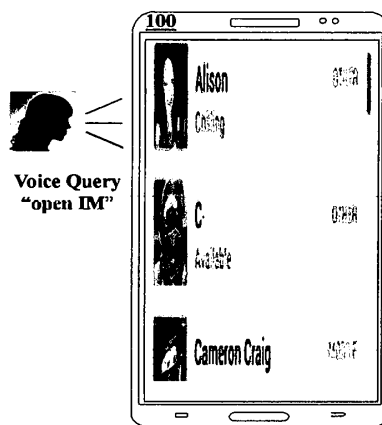
1- hop success

FIG. 3A
(Prior art)



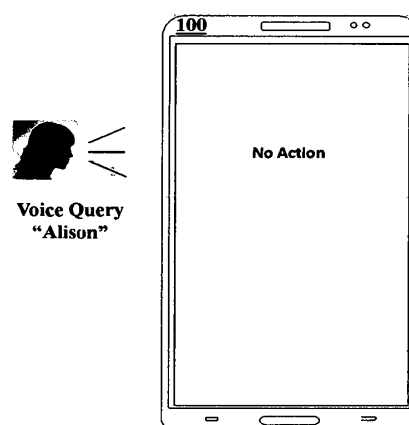
2- hop fail

FIG. 3B
(Prior art)



1-Hop: Success !

FIG. 4A
(Prior art)



2-Hop: Fail !

FIG. 4B
(Prior art)

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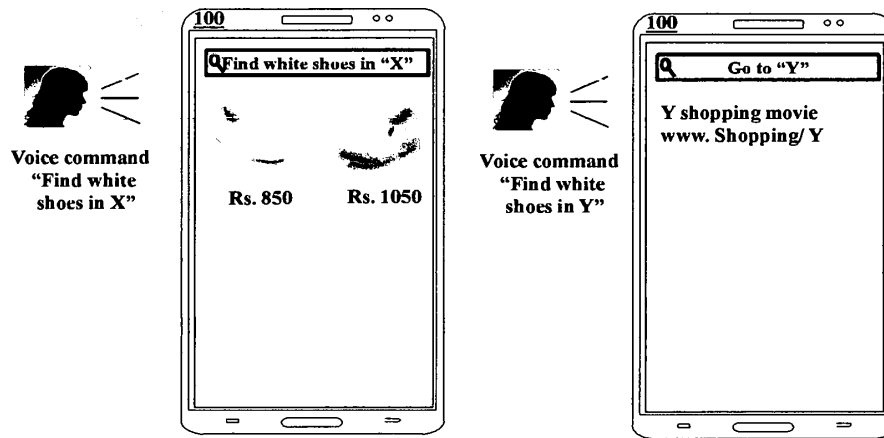


FIG. 5A
(Prior art)

FIG. 5B
(Prior art)

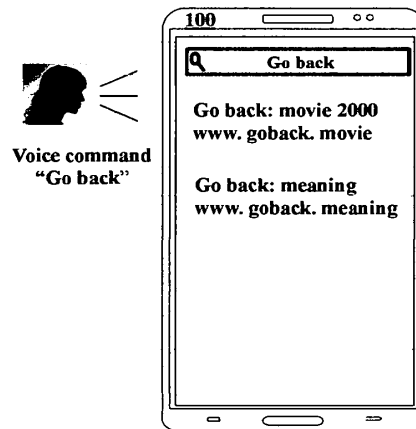


FIG. 5C
(Prior art)

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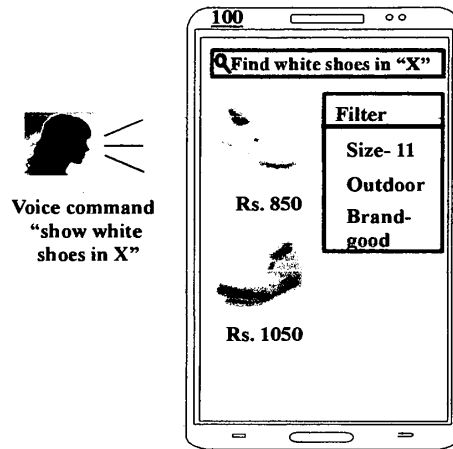


FIG. 6A
(Prior art)

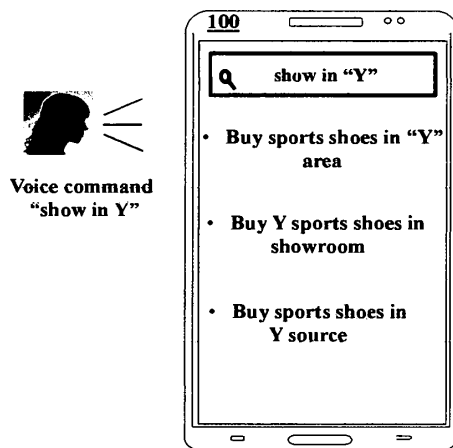


FIG. 6B
(Prior art)

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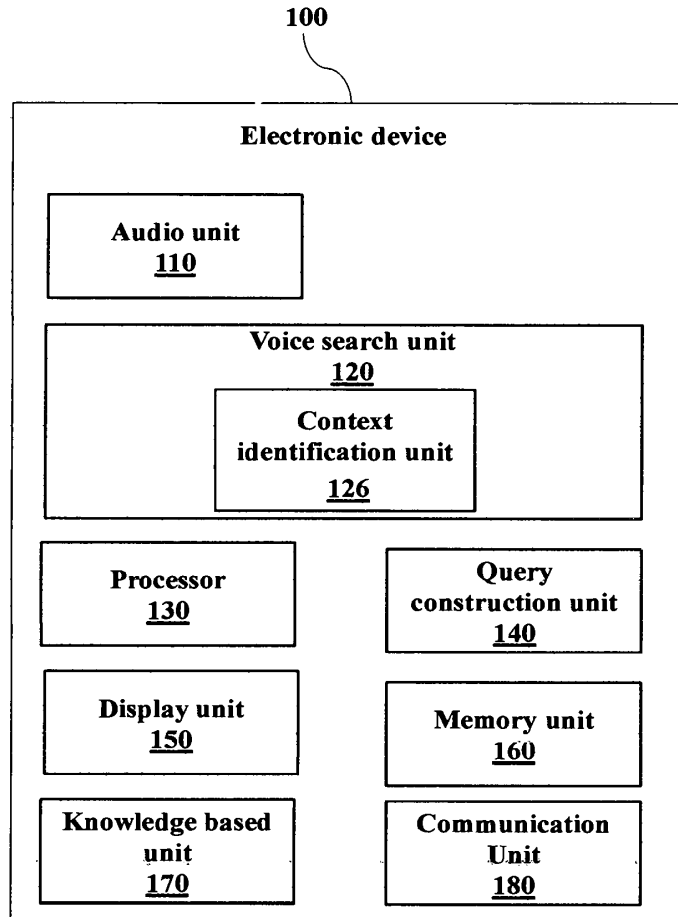


FIG. 7

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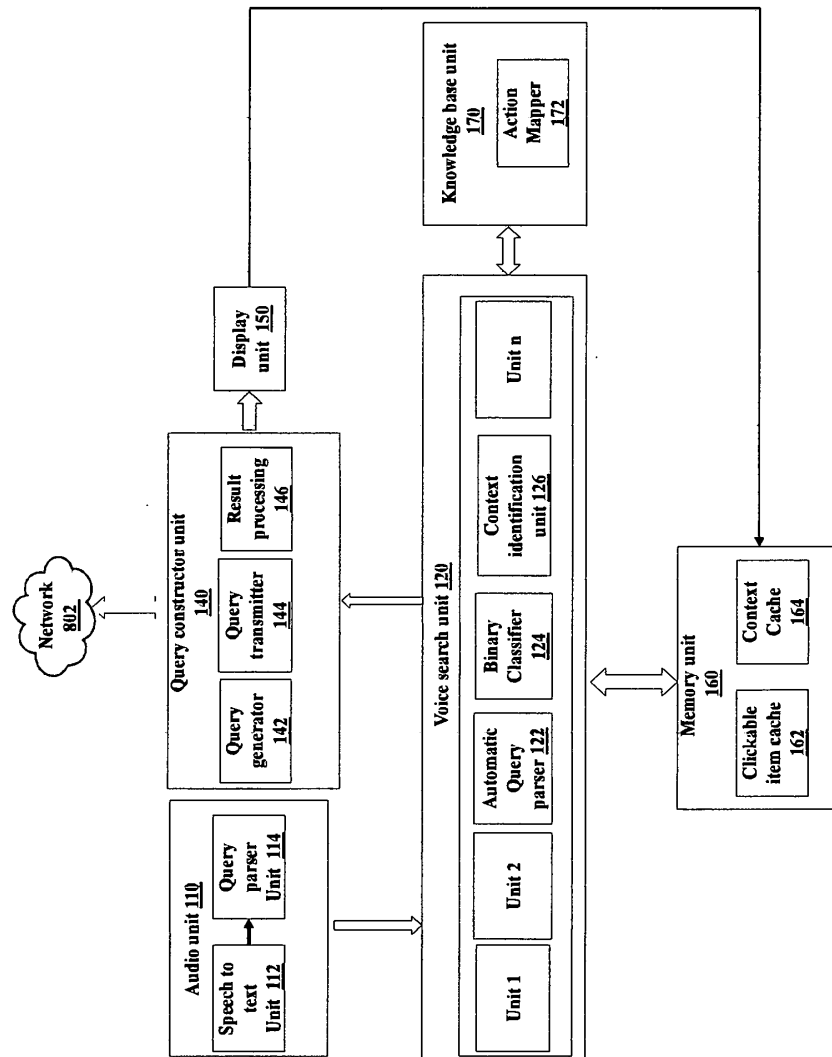


FIG. 8

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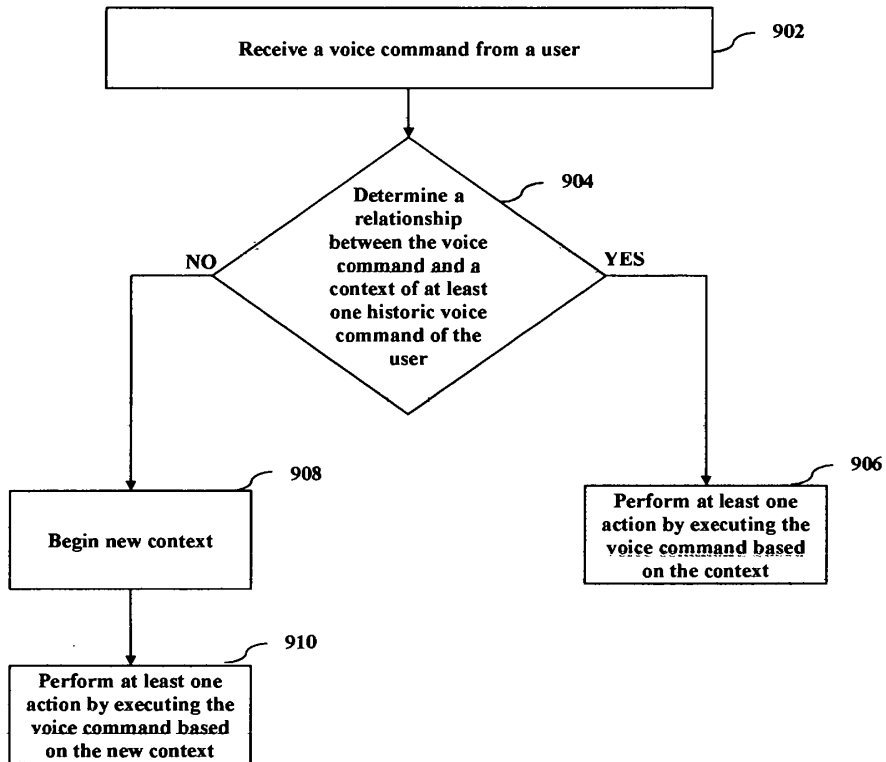
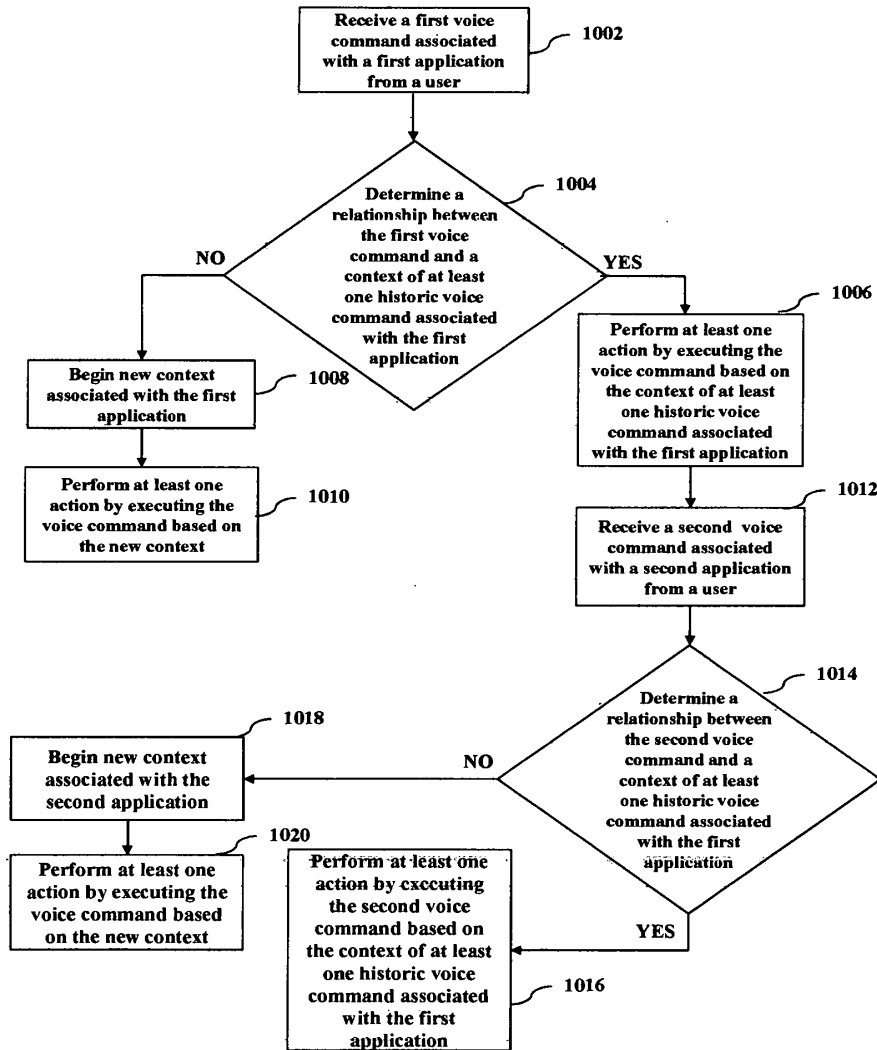


FIG. 9

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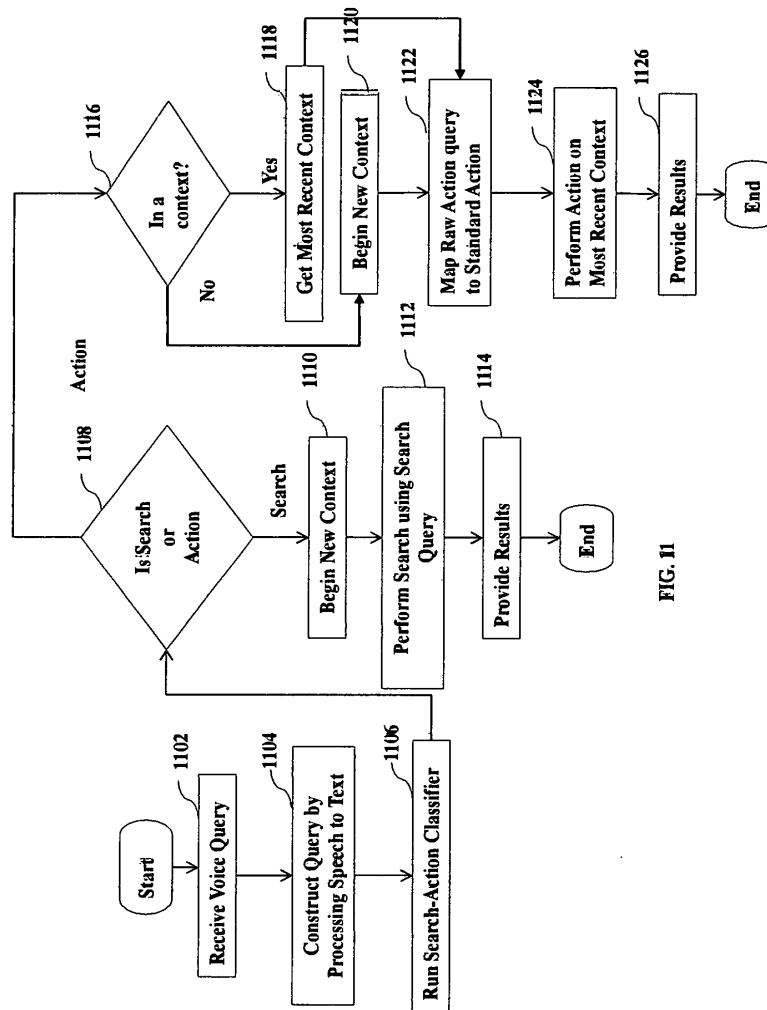


FIG. 11

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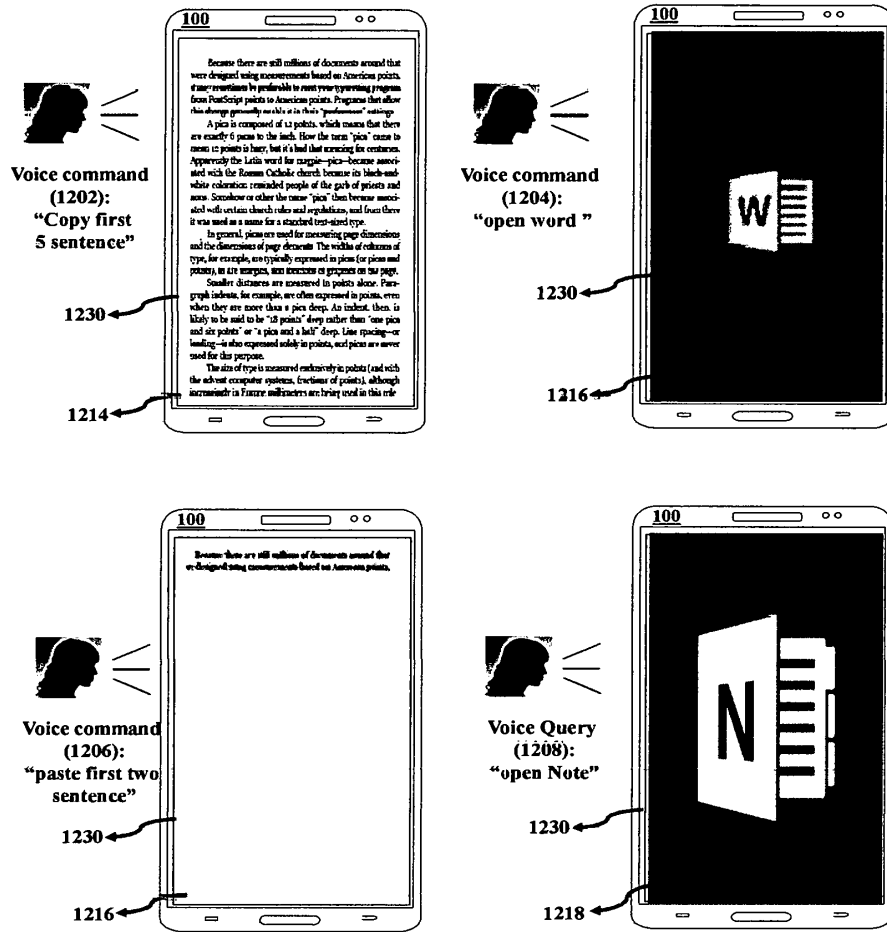


FIG. 12

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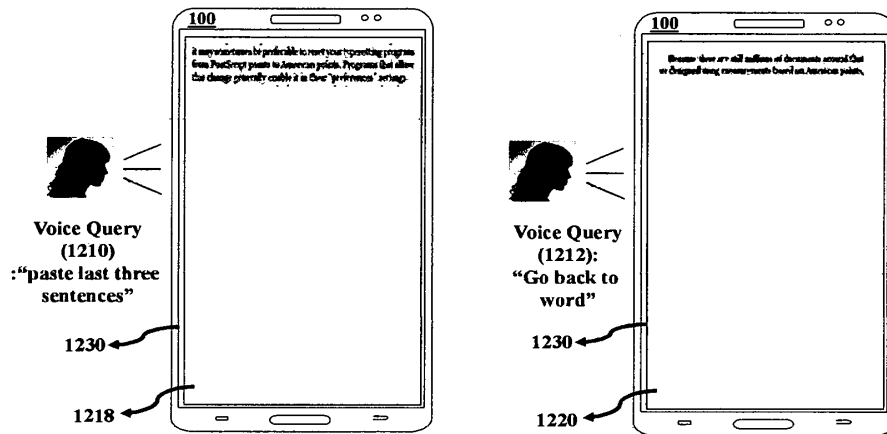


FIG. 12
(Contd..)

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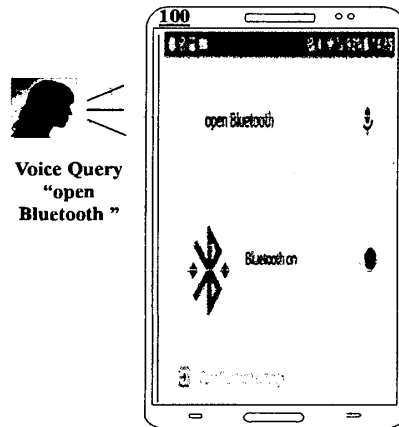


FIG. 13A

1-Hop: Success!

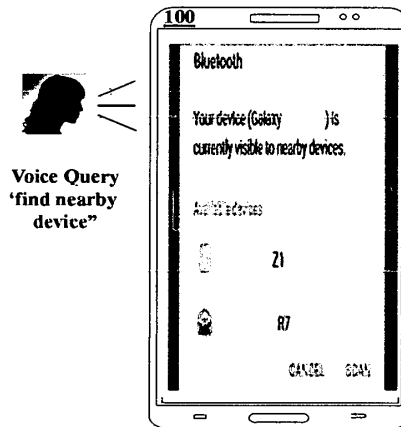


FIG. 13B

1-Hop: Success!



FIG. 14A

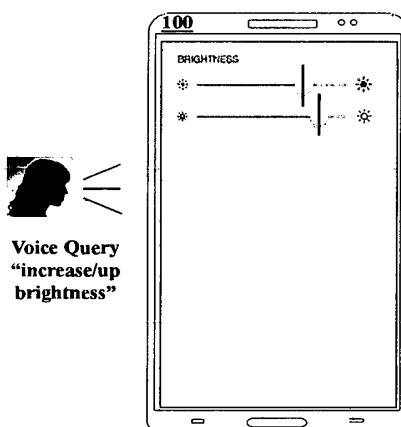


FIG. 14B

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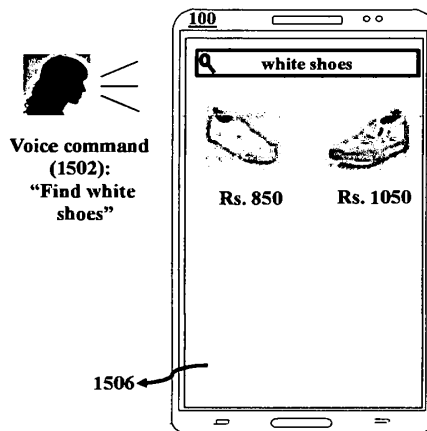


FIG. 15A

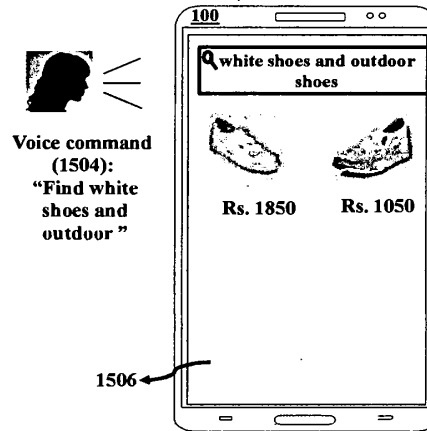


FIG. 15B

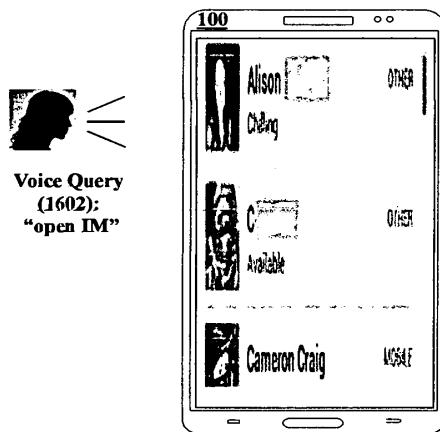


FIG. 16A

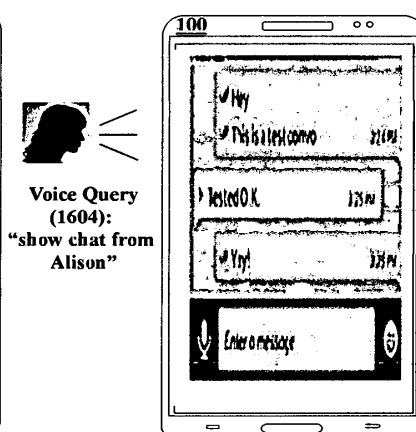
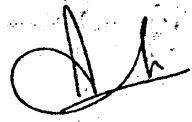


FIG. 16B


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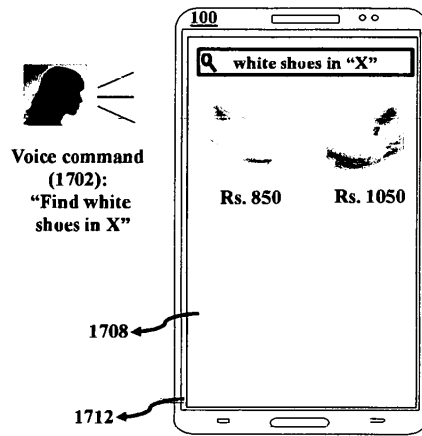


FIG. 17A

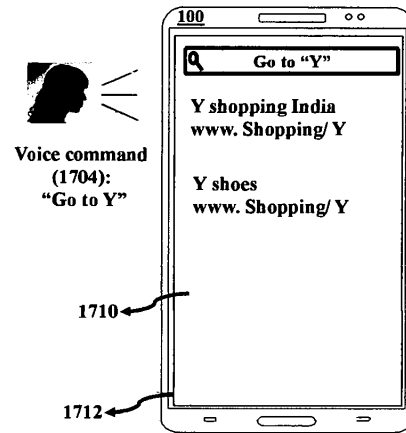


FIG. 17B

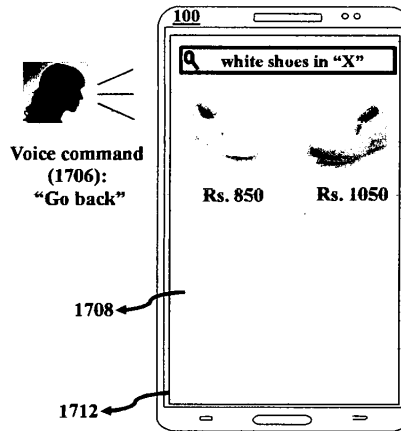


FIG. 17C

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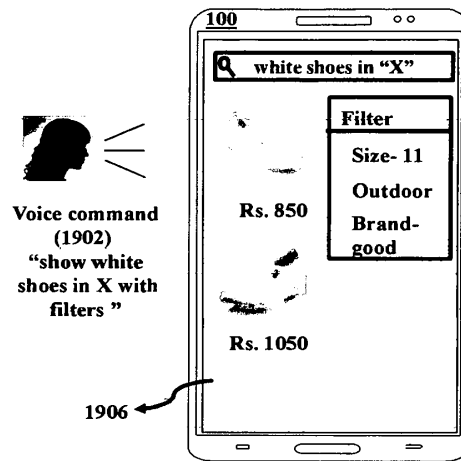


FIG. 19A

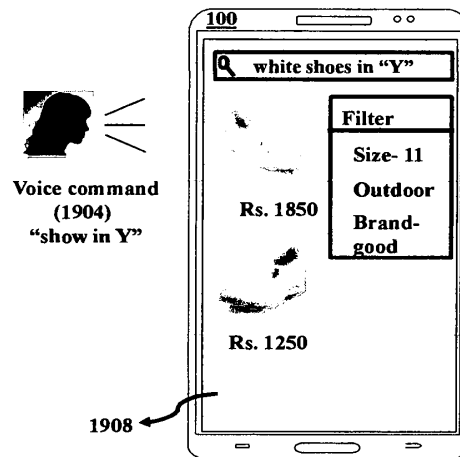


FIG. 19B

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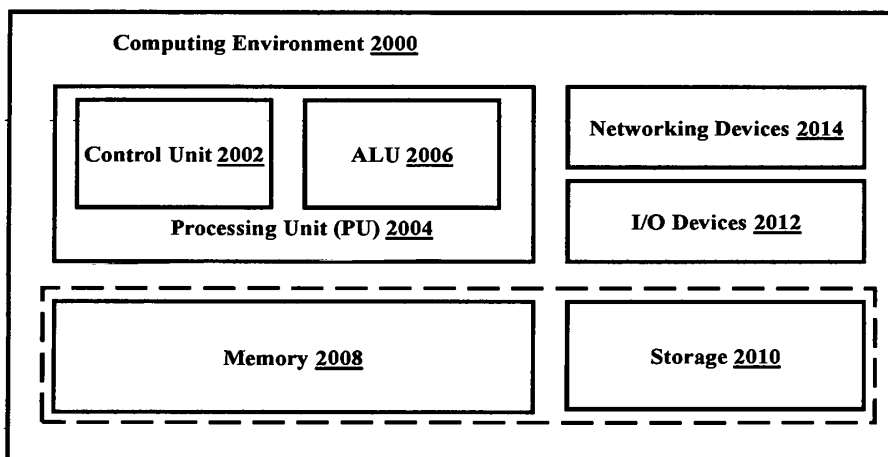


FIG. 20

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INTELLECTUAL PROPERTY
INDIA



सत्यमेव जयते

GOVERNMENT OF INDIA
PATENT OFFICE
MINISTRY OF COMMERCE AND INDUSTRY
Department of Industrial Policy and Promotion

It is hereby certified that annexed here to is a true copy of **Provisional Specification, Abstract and Drawings** of the patent application as filed and as detailed below:-

Date of Application : 12/02/2016
Application No. : 201641004997
Applicant : M/s. Samsung R&D Institute India - Bangalore Private Limited, an Indian Company of #2870, Orion Building, Bagmane Constellation Business Park, Outer Ring Road, Doddanekundi Circle, Marathahalli Post, Bangalore-560037.

In witness there of
I have here unto set my hand

Dated this the 30th day of January 2017
10th day of Magha 1938(Saka)

By Authority of
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(R. RAJINI)

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FORM 2

The Patent Act 1970

(39 of 1970)

&

The Patent Rules, 2005

PROVISIONAL SPECIFICATION

(SEE SECTION 10 AND RULE 13)

TITLE OF THE INVENTION

“Method for two dimensional voice search”

APPLICANTS:

Name : Samsung R & D Institute India -
Bangalore Private Limited

Nationality : Indian

Address : # 2870, Orion Building, Bagmane Constellation
Business Park, Outer Ring Road, Doddanekundi
Circle, Marathahalli Post, Bangalore-560037

The following specification describes the invention:

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12/02/2016

FIELD OF INVENTION

[0001] The present method relates to electronic devices and more particularly to a method for two dimensional voice search.

BACKGROUND OF INVENTION

[0002] Currently voice search is restricted to is one hop breadth
5 search. The one hop breadth search covers a wide range of topics. When the user searches for a term, the information is retrieved and the search terminates at the result. The disadvantage with one hop search is that, the user interaction with the electronic device is a mixture of voice and touch. This is a major drawback. There is no means to navigate within the
10 perspective of the result without switching from voice to touch.

[0003] The depth search method allows a user to go deeper into the search result using only voice commands. The depth search method not only allows users to go deep but also allows them to travel back to where they began. As a result users can have a seamless and intangible flow of
15 conversation with the electronic device.

OBJECT OF INVENTION

[0004] The principal object of the embodiments herein is to provide a method for two dimensional voice search.

SUMMARY

[0005] Accordingly embodiments herein provide a method for two
20 dimensional voice search. The method includes automatic context switching based on classification of the natural language query to be either a search or an action. The method provides a completely intangible interaction with the electronic device especially when hands are not free
25 (example scenarios are while driving, cooking or exercising). The method provides an intelligent means to not only search the web but also to navigate the electronic device by interacting with the device using natural language. The method allows multi hop navigation and depth search as

opposed to breadth search in most personal assistance software. The method provides a complete Artificial intelligence (AI) based human device interaction.

5 [0006] These and other aspects of the embodiments herein will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following descriptions, while indicating preferred embodiments and numerous specific details thereof, are given by way of illustration and not of limitation. Many changes and modifications
10 may be made within the scope of the embodiments herein without departing from the spirit thereof, and the embodiments herein include all such modifications.

BRIEF DESCRIPTION OF FIGURES

[0007] This method is illustrated in the accompanying drawings, throughout which like reference letters indicate corresponding parts in the
15 various figures. The embodiments herein will be better understood from the following description with reference to the drawings, in which:

[0008] FIG. 1 illustrates a 2-D voice search concept diagram, according to the embodiments as disclosed herein;

20 [0009] FIG. 2 illustrates 2-D voice search flow diagram, according to the embodiments as disclosed herein;

[0010] FIG. 3 illustrates 2-D voice search system architecture, according to the embodiments as disclosed herein;

25 [0011] FIG. 4 illustrates a use case scenario of 2-D voice search in an application, according to the embodiments as disclosed herein;

[0012] FIG. 5 illustrates a use case scenario of 2-D voice search in Smartphone/TV settings, according to the embodiments as disclosed herein;

[0013] FIG. 6 illustrates a use case scenario of 2-D voice search in online shopping, according to the embodiments as disclosed herein;

[0014] FIG. 7 illustrates a use case scenario of 2-D voice search in backward navigation, according to the embodiments as disclosed herein;

[0015] FIG. 8 illustrates a use case scenario of 2-D voice search in multi-hop search, according to the embodiments as disclosed herein;

5 [0016] FIG. 9 illustrates a use case scenario of 2-D voice search in car/driving mode, according to the embodiments as disclosed herein; and

[0017] FIG. 10 illustrates a use case scenario of 2-D voice for user behavior, according to the embodiments as disclosed herein.

DETAILED DESCRIPTION OF INVENTION

[0018] The embodiments herein and the various features and advantageous details thereof are explained more fully with reference to the non-limiting embodiments that are illustrated in the accompanying drawings and detailed in the following description. Descriptions of well-known components and processing techniques are omitted so as to not unnecessarily obscure the embodiments herein. Also, the various embodiments described herein are not necessarily mutually exclusive, as some embodiments can be combined with one or more other embodiments to form new embodiments. The term “or” as used herein, refers to a non-exclusive or, unless otherwise indicated. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein can be practiced and to further enable those skilled in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting the scope of the embodiments herein.

[0019] Accordingly embodiments herein provide a method for two dimensional voice search. The method includes automatic context switching based on classification of the natural language query to be either a search or an action. The method provides a completely intangible interaction with the electronic device especially when hands are not free (example scenarios are while driving, cooking or exercising). The method provides an intelligent means to not only search the web but also to navigate the electronic device by interacting with the device using natural language. The method allows multi hop navigation and depth search as opposed to breadth search in most personal assistance software. The method provides a complete Artificial intelligence (AI) based human device interaction.

[0020] Unlike conventional methods, in the proposed method, there is no notion of a controller for each state since number of possible states is

1

infinite. In the proposed method there is no necessity for explicitly specifying the context. The method allows automatic context switching based on classification of the natural language query to be either a search or an action. There is no dedicated controller for context; context is derived

5 purely from the voice query and the most recent search results based on the voice query. The method provides a completely intangible interaction with the electronic device especially when hands are not free (example scenarios are while driving, cooking or exercising). In case of emergency in which users cannot use their hands to reach out to their electronic device, they can

10 still interact with the device using voice. The method provides an intelligent means to not only search the web but also to navigate the electronic device by interacting with the device using natural language. The method allows multi hop navigation and depth search as opposed to breadth search in most personal assistance software. The method provides a

15 complete Artificial intelligence (AI) based human device interaction. The users can name their electronic device or customize instructions to initiate conversation which will make the electronic device more personal. The method helps those users with disability that cannot interact with the electronic device effectively using touch. In the present scenario, simple

20 voice control IoT devices provide options such as switching the light on/off, temperature up/down or the like. Unlike such conventional scenarios, in the proposed method provides depth search for more intelligent human like interaction. The method also provides enhanced menu navigation using voice. In the present scenario, a user queries

25 "volume" to see current volume level. The user wants to take volume level up/down. The user queries "volume up/down" each time the user wants to take it up/down. Unlike such conventional scenarios, in the proposed method, the user queries "volume" to see current volume level. The volume comes up and context {"volume"} is stored. The user only uses query

“up/down” to take the volume up or down. The user can use keyword “up/down by five” instead of “volume up/down by five” each time. In the present scenario, a user queries “open browser”. The browser opens in TV. The user switches to remote for browsing. Unlike such conventional scenarios, in the proposed method, the user queries “open browser”. The browser opens in TV. Then the user browses using voice. The advantages of the proposed method are that, the voice assistance flow is now more intuitive, the user need not repeatedly use long queries since the most recent context is preserved. Navigating TV menu is much easier using voice as there is no need to memorize all menu items.

[0021] Referring now to the drawings, and more particularly to FIGS. 1 through 10, there are shown preferred embodiments.

[0022] FIG. 1 illustrates a 2-D voice search concept diagram, according to the embodiments as disclosed herein.

[0023] FIG. 2 illustrates 2-D voice search flow diagram, according to the embodiments as disclosed herein.

[0024] FIG. 3 illustrates 2-D voice search system architecture, according to the embodiments as disclosed herein.

[0025] FIG. 4 illustrates a use case scenario of 2-D voice search in an application, according to the embodiments as disclosed herein.

[0026] In the present scenario, a user queries an instant messaging application. The instant messaging application is opened and the voice search ends. Unlike such conventional scenarios, in the proposed method, user queries an instant messaging application. The instant messaging application is opened and context is stored. The User queries “show chat from Alison”. Chat window for “Alison” is opened and context is changed to {“Instant Messaging”, “chat from X”}.

[0027] In the present scenario, a user queries “Open Gallery”. The gallery application is opened and the search ends. Unlike such conventional

scenarios, in the proposed method, user queries “Open Gallery”. The gallery is opened and context {“gallery”} is stored. The User queries “show album”. Album window for “Alison” is opened and context is changed to {“Gallery”, “Album”}.

5 [0028] FIG. 5 illustrates a use case scenario of 2-D voice search in Smartphone/TV settings, according to the embodiments as disclosed herein.

 [0029] In the present scenario, a user queries “Open Bluetooth” to connect to another device. Bluetooth is switched ON and voice search ends. Unlike such conventional scenarios, in the proposed method, user queries
10 “Open Bluetooth” to connect to another device. Bluetooth is opened and context {“Bluetooth”} is stored. The User queries “list nearby devices” to get a list of nearby devices. A list is shown and the context is changed to {“Bluetooth”, “list of nearby devices”}.

 [0030] In the present scenario, a user wants to control brightness slider using voice. Currently there is no support for slider control, thus
15 touch control has to be used. Unlike such conventional scenarios, in the proposed method, user queries “Brightness” to open brightness slider. The context {“brightness”} is stored. The User queries “up/down” to move brightness slider.

20 [0031] FIG. 6 illustrates a use case scenario of 2-D voice search in online shopping, according to the embodiments as disclosed herein.

 [0032] FIG. 7 illustrates a use case scenario of 2-D voice search in backward navigation, according to the embodiments as disclosed herein.

 [0033] FIG. 8 illustrates a use case scenario of 2-D voice search in
25 multi-hop search, according to the embodiments as disclosed herein.

 [0034] FIG. 9 illustrates a use case scenario of 2-D voice search in car/driving mode, according to the embodiments as disclosed herein.

 [0035] In an example scenario, considering the conventional systems, a user while driving wants to go to nearby Chinese restaurant. The

user is not sure and wants to see the available options. The user queries “find Chinese restaurant nearby”. No result is returned, since navigation can only navigate to specific locations. Unlike such conventional scenarios, in the proposed method, a list of Chinese restaurant in text is returned and context “Chinese restaurant nearby” is stored. The user likes restaurant “X” and queries “take me to X”. Then, the direction to “X” from current location is shown.

[0036] In the present scenario, a user queries “find Chinese restaurant nearby” and is unable to read the entire list. The user asks the electronic device to read out the list and nothing happens. Unlike such conventional scenarios, in the proposed method, user queries “find Chinese restaurant nearby” and is unable to see the list. The user queries “read list” and device reads the list of restaurants. The user likes restaurant “X” and queries “take me to X”. Finally, the direction to “X” from current location is shown.

[0037] FIG. 10 illustrates a use case scenario of 2-D voice for user behavior, according to the embodiments as disclosed herein.

[0038] In the present scenario, a user queries using voice. The search results are returned in the form of a list. The user uses touch to explore the options. The limitation however is that user thought sequence is difficult to capture. Unlike such conventional scenarios, in the proposed method, the user queries using voice. The search results are returned in the form of a list. The user uses voice depth search to explore. The advantages of the proposed method are that user’s thoughts are captured in the form of text which can be used for sequence pattern mining and association rule mining.

[0039] The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various

applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the embodiments as described herein.

ABSTRACT

Embodiments herein provide a method for two dimensional voice search. The method includes automatic context switching based on classification of the natural language query to be either a search or an action. The method provides a completely intangible interaction with the electronic device especially when hands are not free (example scenarios are while driving, cooking or exercising). The method provides an intelligent means to not only search the web but also to navigate the electronic device by interacting with the device using natural language. The method allows multi hop navigation and depth search as opposed to breadth search in most personal assistance software. The method provides a complete Artificial intelligence (AI) based human device interaction.

Dated: 12th Day of February, 2016

Signature



Arun Kishore Narasani

Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Total No Of Sheets: 10
Sheet No.: 1/10

Application Number:

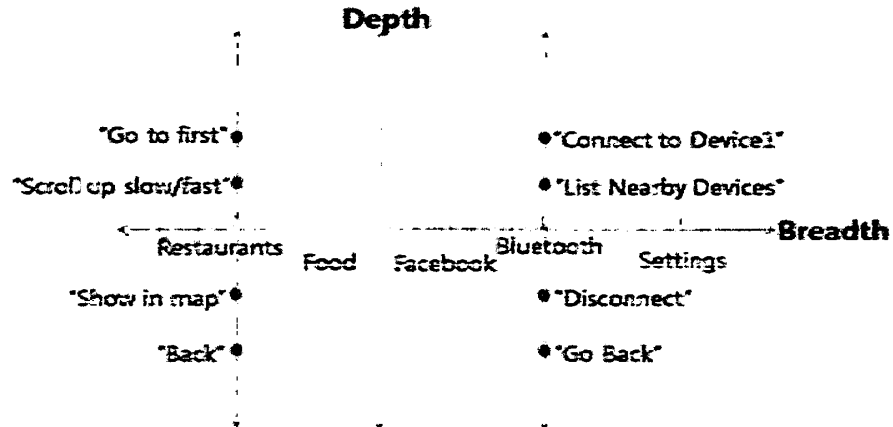


FIG. 1

Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

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Total No Of Sheets: 10
Sheet No.: 2/10

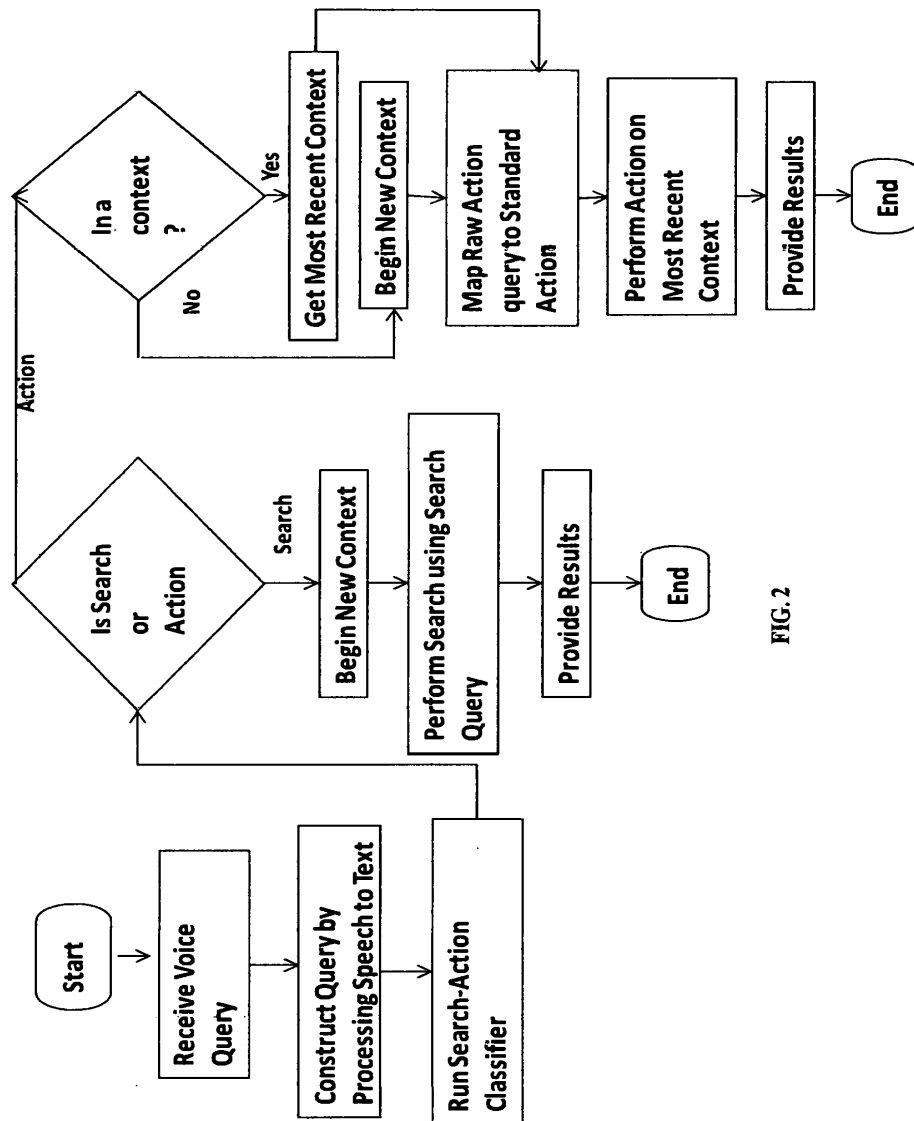


FIG. 2

Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Total No Of Sheets: 10
Sheet No.: 3/10

Application Number:

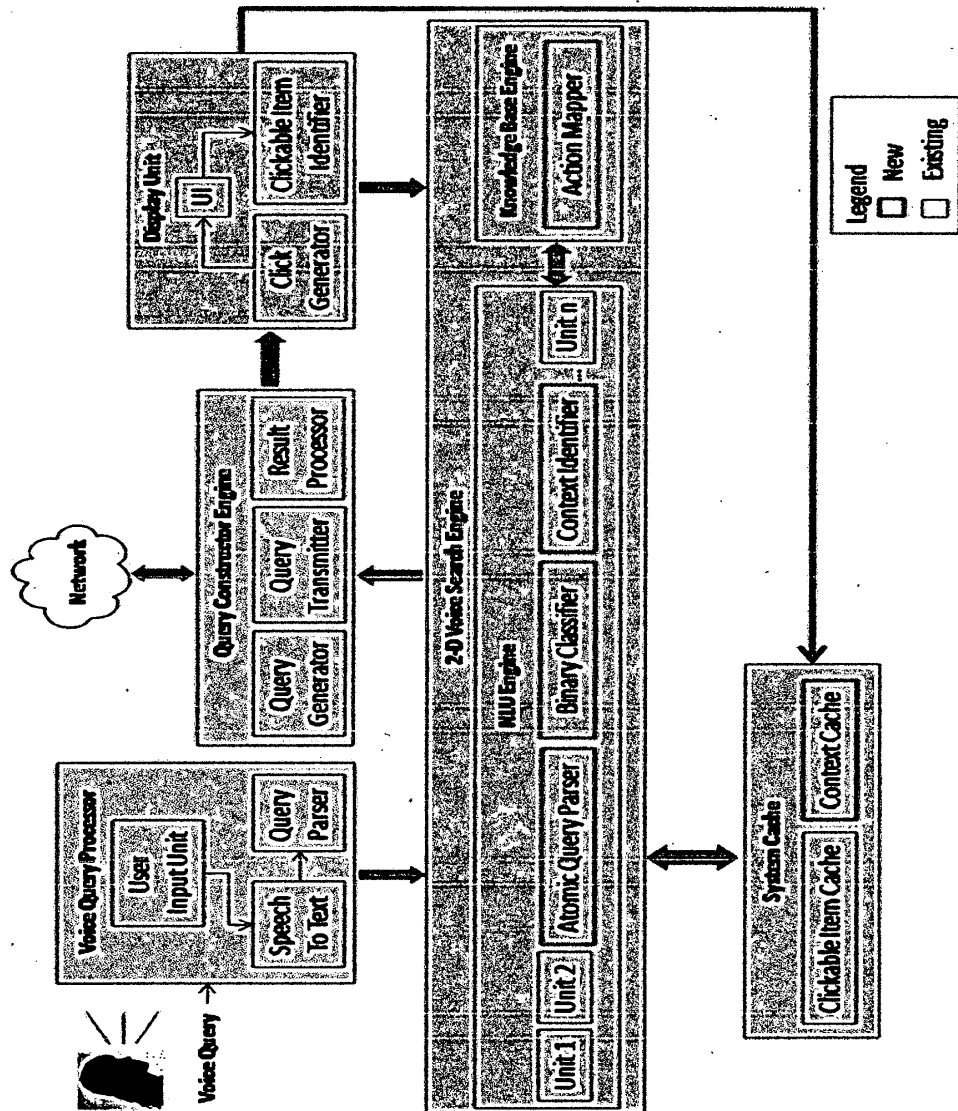


FIG. 3


Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Application Number:

Total No Of Sheets: 10
Sheet No.: 4/10

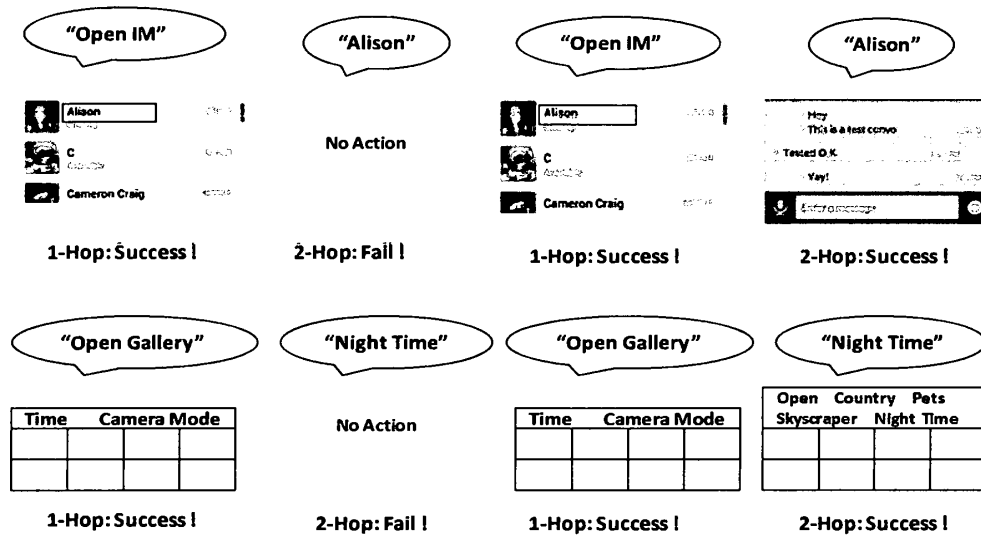


FIG. 4

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Patent Agent

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Total No Of Sheets: 10
Sheet No.: 5/10

Application Number:

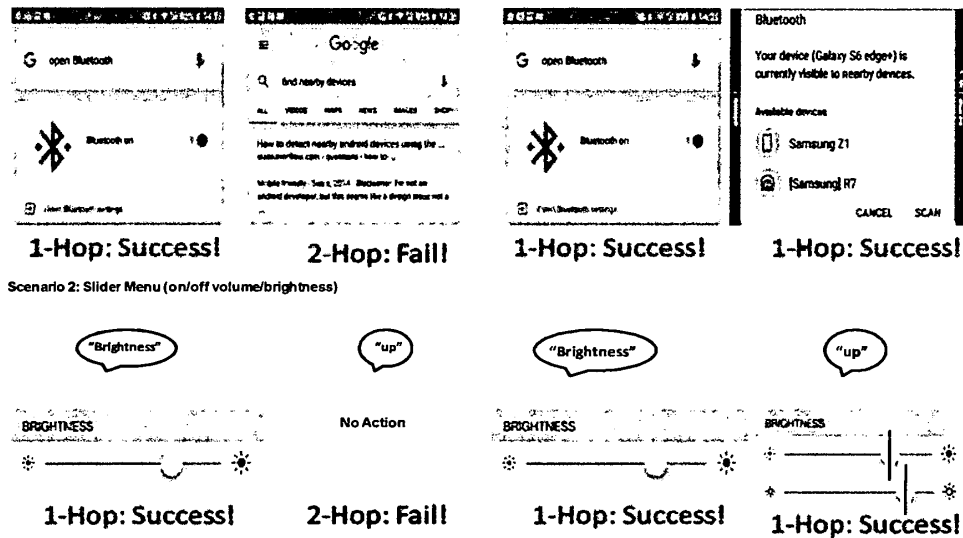
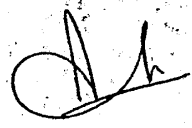


FIG. 5


Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Total No Of Sheets: 10
Sheet No.: 6/10

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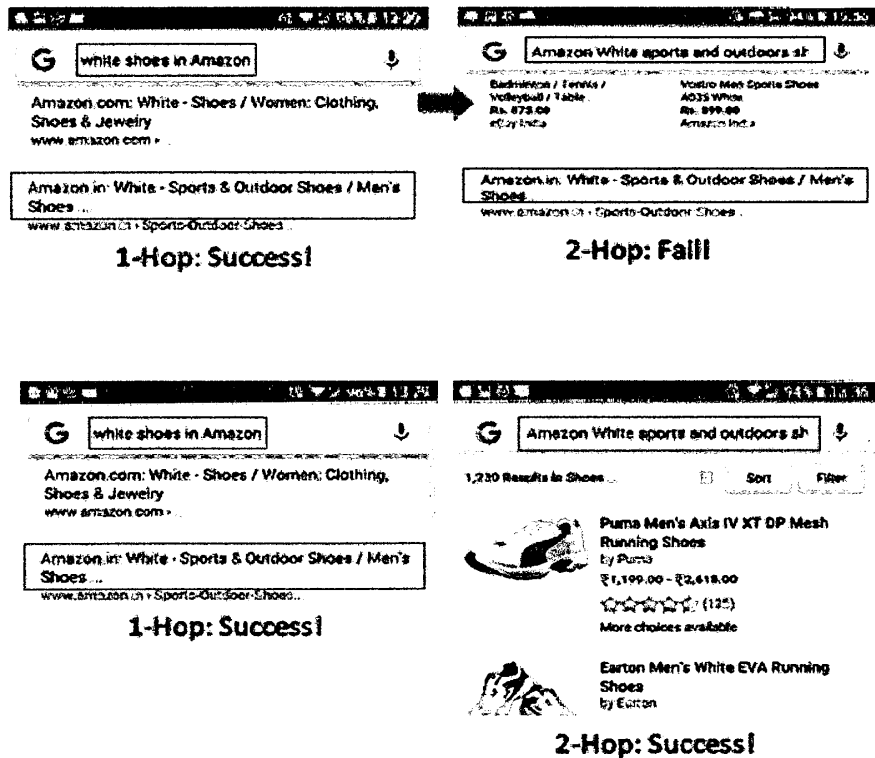


FIG. 6

Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Application Number:

Total No Of Sheets: 10

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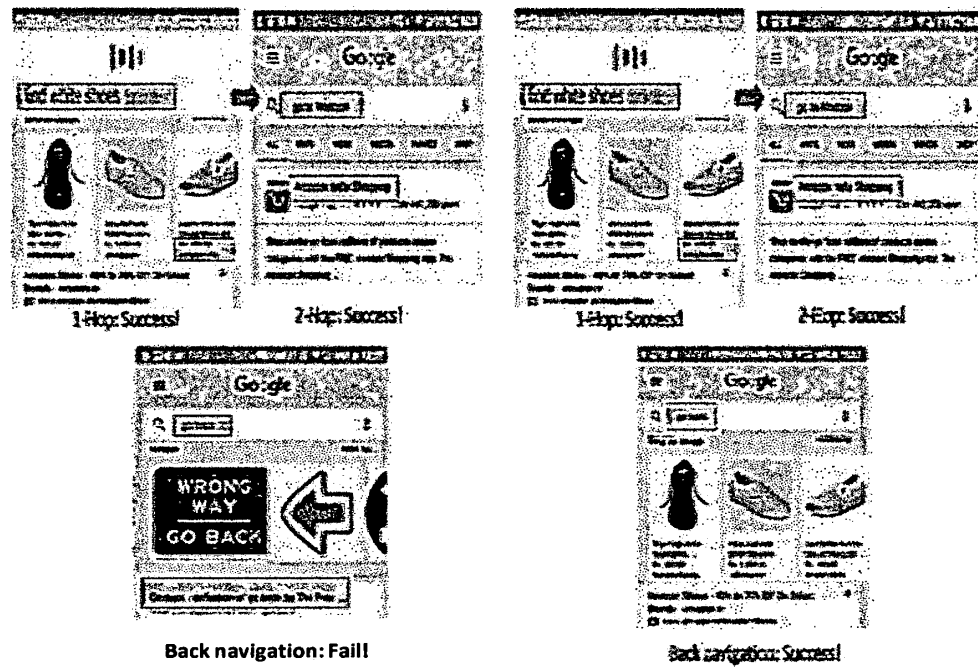


FIG. 7


Arun Kishore Narasani
Patent Agent

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Total No Of Sheets: 10
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Application Number:

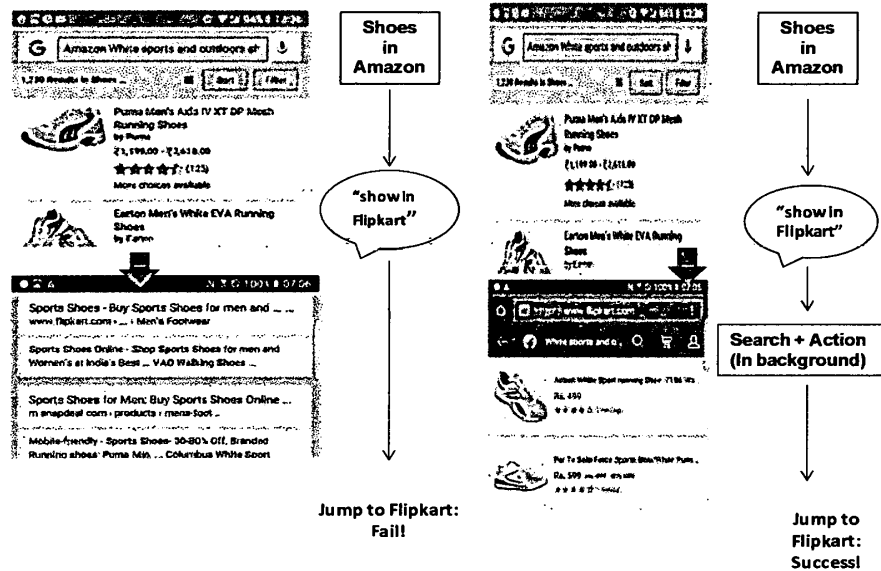


FIG. 8


Arun Kishore Narasani
Patent Agent

**Name of the Applicant: Samsung R & D Institute India- Bangalore
Private Limited.**

Application Number:

**Total No Of Sheets: 10
Sheet No.: 9/10**

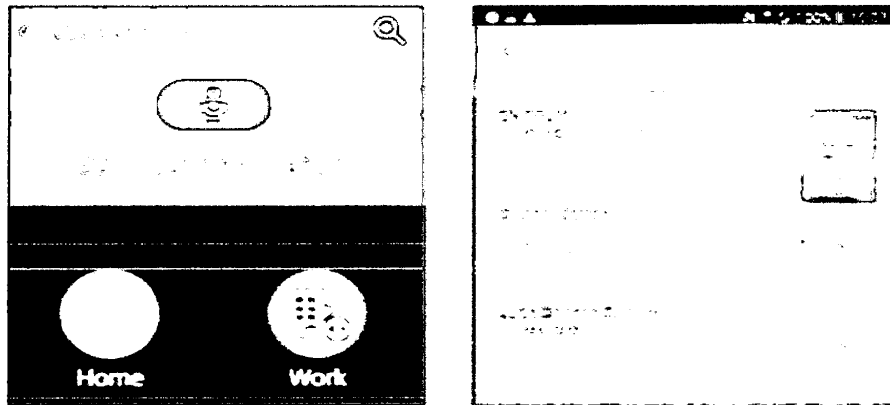


FIG. 9

**Arun Kishore Narasani
Patent Agent**

Name of the Applicant: Samsung R & D Institute India- Bangalore Private Limited.

Application Number:

Total No Of Sheets: 10
Sheet No.: 10/10

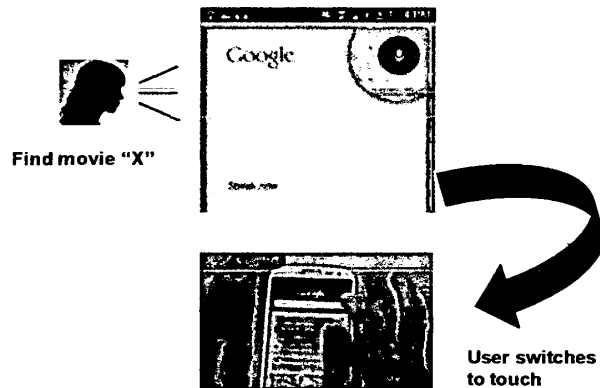
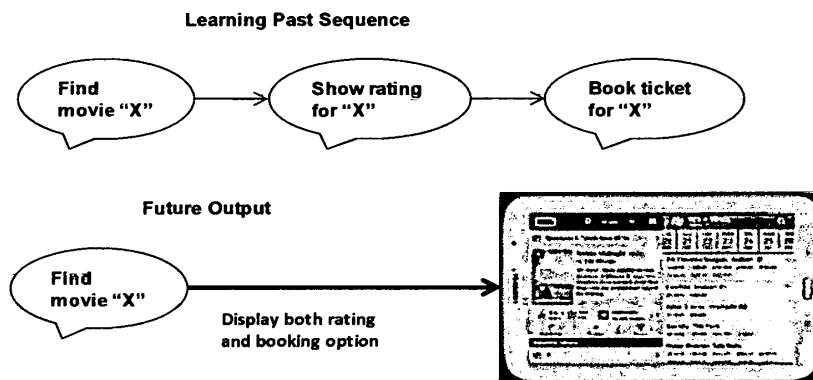


FIG. 10

Arun Kishore Narasani
Patent Agent



IPW

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Docket No: Q231458

Arunabha CHOUDHURY, et al.

Appln. No.: 15/429,715

Group Art Unit: 2658

Confirmation No.: 5067

Examiner: Not Yet Assigned

Filed: February 10, 2017

For: METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

SUBMISSION OF PRIORITY DOCUMENTS

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

Sir:

Submitted herewith are certified copies of the priority documents on which claims to priority was made under 35 U.S.C. § 119. The Examiner is respectfully requested to acknowledge receipt of said priority documents.

Respectfully submitted,

/Christopher R. Lipp/
Christopher R. Lipp
Registration No. 41,157

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE

23373

CUSTOMER NUMBER

Enclosures with certified copies of::

Indian Provisional Application No. 201641004997 (PS), filed on February 12, 2016

Indian Non-Provisional Application No. 201641004997 (CS), filed on December 5, 2016

Date: February 17, 2017

UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>		Attorney Docket No. Q231458	
		First Named Inventor Arunabha CHOUDHURY	
		Title	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
		Express Mail Label No.	
APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>		Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450	
1. ☒ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☐ Applicant asserts small entity status. See 37 CFR 1.27. 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>36</u>] Both the claims and abstract must start on a new page. <i>(See MPEP § 608.01(a) for information on the preferred arrangement)</i> 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>23</u>] 6. Inventor's Oath or Declaration [Total Sheets <u>2</u>] <i>(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))</i> a. ☒ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet. *See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (<i>Appendix</i>) ☐ Landscape Table on CD 9. ☐ Nucleotide and/or Amino Acid Sequence Submission <i>(if applications, items a. – c. are required)</i> a. ☐ Computer Readable Form (CRF) b. Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies		ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee <u>SAMSUNG ELECTRONICS CO., LTD.</u> 11. ☐ 37 CFR 3.73(c) Statement ☒ Power of Attorney <i>(when there is an assignee)</i> 12. ☐ English Translation Document <i>(if applicable)</i> 13. ☐ Information Disclosure Statement <i>(PTO/SB/08 or PTO-1449)</i> ☐ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt PostCard <i>(MPEP § 503)(Should be specifically itemized)</i> 16. ☐ Certified Copy of Priority Document(s) <i>(if foreign priority is claimed)</i> 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☒ Priority is claimed from: IN 201641004997 2016-02-12 IN 201641004997 2016-12-05 19. ☐ Other:	
Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS). (2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).			
☒ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.			
20. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76: ☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: Prior application information: Examiner: Art Unit:			
21. CORRESPONDENCE ADDRESS			
<div style="display: flex; justify-content: space-between; align-items: center;"> <div> ☒ The address associated with Customer Number: </div> <div style="text-align: center;"> WASHINGTON OFFICE 23373 CUSTOMER NUMBER </div> <div> OR ☐ Correspondence address below </div> </div>			
Signature /Christopher R. Lipp/		Date February 10, 2017	
Name Christopher R. Lipp		Registration No. 41,157	

FEE TRANSMITTAL		Complete if Known	
☐ Applicant asserts small entity status. See 37 CFR 1.27. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be attached or have been submitted previously. TOTAL AMOUNT OF PAYMENT (\$1,600		Application Number	Not Yet Assigned
		Filing Date	February 10, 2017
		First Named Inventor	Arunabha CHOUDHURY
		Examiner Name	Not Yet Assigned
		Art Unit	Not Yet Assigned
		Docket No.	Q231458

METHOD OF PAYMENT (check all that apply)	
☐ Check ☒ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____	
☐ Deposit Account Deposit Account Number: <u>19-4880</u> Deposit Account Name: <u>Sughrue Mion, PLLC</u>	
For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)	
☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the Issue Fee and the Publication Fee ☐ Charge fee(s) indicated below, except for the filing fee, the Issue Fee and the Publication Fee ☒ Charge any additional fee(s), except for the Issue Fee and the Publication Fee, or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☒ Credit any overpayment of fees(s)	

FEE CALCULATION											
1. BASIC FILING, SEARCH, AND EXAMINATION FEES (U = undiscounted fee; S = small entity fee; M = micro entity fee)											
	FILING FEES			SEARCH FEES			EXAMINATION FEES			Fees Paid (\$)	
Application Type	U(\$)	S(\$)	M(\$)	U(\$)	S(\$)	M(\$)	U(\$)	S(\$)	M(\$)		
Utility	280	140*	70	600	300	150	720	360	180		1,600
Design	180	90	45	120	60	30	460	230	115		
Plant	180	90	45	380	190	95	580	290	145		
Reissue	280	140	70	600	300	150	2160	1080	540		
Provisional	260	130	65	0	0	0	0	0	0		
* The \$140 small entity status filing fee for a utility application is further reduced to \$70 for a small entity status applicant who filed the application via EFS-Web.											
2. EXCESS CLAIM FEES											
Fee Description	Undiscounted Fee (\$)	Small Entity Fee (\$)	Micro Entity Fee (\$)								
Each claim over 20 (including Reissues)	80	40	20								
Each independent claim over 3 (including Reissues)	420	210	105								
Multiple dependent claims	780	390	195								
Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)	Multiple Dependent Claims Fee (\$)	Fee Paid (\$)						
20	- 20 or HP = 0	X	80	=	0						
HP = highest number of total claims paid for, if greater than 20.											
Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)								
3	- 3 or HP = 0	X	420	=	0						
HP = highest number of independent claims paid for, if greater than 3.											
3. APPLICATION SIZE FEE											
If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$400 (\$200 for small entity or \$ 100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).											
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)							
59	- 100 = 0	/ 50	0	(round up to a whole number) x	400						
59 * .75	44 - 100 = 0	/ 50	0	EFS Fee Discount	400						
4. OTHER FEE(S)											
Non-English Specification, \$140 fee (\$ 70 for small entity or \$35 for micro entity)											Fees Paid (\$)
Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, \$400 fee (\$200 small or micro entity)											
Other (e.g., late filing surcharge):											
SUBMITTED BY											
Signature	/Christopher R. Lipp/			Registration No. (Attorney/Agent)	41,157			Telephone: 202.293.7060			
Name (Print/Type)	Christopher R. Lipp							Date: February 10, 2017			

ABSTRACT

A method performing voice based actions by an electronic device includes receiving a voice command from a user; determining a relationship between the voice command and a context a historic voice command of the user, and performing an action by executing the voice command based on the context of the historic voice command.

WHAT IS CLAIMED IS:

1. A method for performing voice based actions by an electronic device, the method comprising:

receiving, by the electronic device, a first voice command from a user;

determining, by the electronic device, a relationship between the first voice command and a context of at least one historic voice command of the user; and

performing, by the electronic device, at least one action by executing the first voice command based on the context of the at least one historic voice command.

2. The method of claim 1, further comprising, in response to determining that there is no relationship between the first voice command and the context of the at least one historic voice command of the user:

beginning a new context based on the first voice command; and

performing, by the electronic device, at least one action by executing the first voice command based on the new context.

3. The method of claim 1, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.

4. The method of claim 1, wherein the context of the at least one historic voice command is dynamically updated.

5. The method of claim 1, wherein the determining the relationship between the first voice command and the context of the at least one historic voice command comprises

determining the relationship between the first voice command and the context of the at least one historic voice command based on at least one of a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command.

6. The method of claim 1, wherein the first voice command is associated with a first application,

the at least one historic voice command is associated with the first application, and

the method further comprises:

receiving, by the electronic device, a second voice command associated with a second application, from the user;

determining, by the electronic device, a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and

performing, by the electronic device, another action by executing the second voice command based on the context of the at least one historic voice command associated with the first application.

7. The method of claim 6, further comprising, in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application:

beginning a new context based on the second voice command;

performing, by the electronic device, at least one action by executing the second voice command based on the new context.

8. The method of claim 1, further comprising:

determining whether the first voice command is for performing a search or an action;
and

in response to determining that the first voice command is for performing a search,
beginning a new context based on the first voice command, performing a search based on the
first voice command, and presenting a result of the search based on the first voice command.

9. The method of claim 1, wherein the at least one action is performed by
executing the first voice command based on a most recent context.

10. An electronic device for performing voice based actions, the electronic device
comprising:

an audio receiver configured to receive a first voice command, from a user; and

a processor configured to:

determine a relationship between the first voice command and a
context of at least one historic voice command of the user, and

perform at least one action by executing the first voice command based
on the context of the at least one historic voice command.

11. The electronic device of claim 10, wherein the processor is further configured
to, in response to determining that there is no relationship between the first voice command
and the context of the at least one historic voice command of the user,:

begin a new context based on the first voice command, and

perform at least one action by executing the first voice command based on the new
context.

12. The electronic device of claim 10, wherein the context of the at least one historic voice command of the user is pre-analyzed and stored in the electronic device.

13. The electronic device of claim 10, wherein the context of the at least one historic voice command is dynamically updated.

14. The electronic device of claim 10, wherein the processor is further configured determine the relationship between the first voice command and the context of the at least one historic voice command based at least one among a semantic similarity, a latent semantic similarity, and an action performed based on the at least one historic voice command.

15. The electronic device of claim 10, wherein the first voice command is associated with a first application,

the at least one historic voice command is associated with the first application,

the audio receiver is further configured to receive a second voice command associated with a second application, from the user, and

the processor is further configured to:

determine a relationship between the second voice command and the context of the at least one historic voice command associated with the first application; and

perform another action by executing the second voice command based on the context of the at least one historic voice command associated with the first application.

16. The electronic device of claim 15, wherein the processor is further configured to, in response to determining that there is no relationship between the second voice command and the context of the at least one historic voice command associated with the first application:

begin a new context based on the second voice command;

perform at least one action by executing the second voice command based on the new context.

17. The electronic device of claim 10, the processor is further configured to:

determine whether the first voice command is for performing a search or an action;

and

in response to determining that the first voice command is for performing a search, begin a new context based on the first voice command, perform a search based on the first voice command, and present a result of the search based on the first voice command.

18. The electronic device of claim 10, wherein the at least one action is performed by executing the first voice command based on a most recent context.

19. A method comprising:

receiving, by a mobile device, a first voice command of a user;

determining an intent of the user by parsing the first voice command;

matching the determined intent of the user with a pre-stored context of a previous user command; and

performing, by the mobile device, a first action by executing the first voice command based on the matched context.

20. The method of claim 19, wherein the first voice command and the first action are associated with a first application executable by the mobile device, and the method further comprises:

receiving, by the mobile device, a second voice command of the user;

determining the intent of the user by parsing the second voice command;

matching the determined intent of the user with the pre-stored context of the previous user command and the first application; and

executing the second voice command based on the matched context within the first application.

METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority from Indian Provisional Application No. 201641004997 filed February 12, 2016, and Indian Application No. 201641004997 filed December 5, 2016, the entire disclosures of which are incorporated herein by reference.

BACKGROUND

1. Field

[0002] Apparatuses and methods consistent with exemplary embodiments relate to retrieving information and, more particularly, to performing voice based actions.

2. Related Art

[0003] An electronic device uses a voice recognition system to recognize an utterance from a user, as for example, a speech vocabulary sequence from a user voice, a voice search command, etc., which is accepted as an input to the voice recognition system. For example, information delivery systems may include a voice portal, a navigation system, and a voice search to explore the content of the applications (supported by voice based search), etc.

[0004] For example, the related art voice recognition system may receive a user input (i.e., voice command, voice query, and/or voice search query), in a voice based search application or any other application related thereof, such as, "Open Bluetooth". The voice recognition system may process the voice query and provide an output to the voice query provided by the user, as for example, enabling the Bluetooth application.

[0005] Further, if the user inputs another voice query, such as "find nearby devices" the voice recognition system may process the voice query and may start searching for the

term "find nearby devices", instead of searching/providing the lists of nearby devices via the Bluetooth application.

[0006] That is, the related art voice search system is restricted to one hop breadth search which covers a wide range of topics and/or items. When the user searches for the item, the information corresponding to the item is retrieved and the search terminates at the result. Further, the electronic device (or, the voice recognition system) does not provide with a provision to the user in navigating back to the previously queried/explored item of the application/or any other application related thereof.

[0007] Further disadvantage with the one hop search is that the user interaction with the electronic device is a mixture of voice and touch and there is no means to navigate within the perspective of the result without switching from the voice to touch.

SUMMARY

[0008] Exemplary embodiments address at least the above problems and/or disadvantages and other disadvantages not described above. Also, the exemplary embodiments are not required to overcome the disadvantages described above, and may not overcome any of the problems described above.

[0009] One or more exemplary embodiments may provide a method for receiving a voice command from a user.

[0010] One or more exemplary embodiments may provide a method for determining a relationship between the voice command and a context of at least one historic voice command of the user.

[0011] One or more exemplary embodiments may provide a method for performing at least one action by executing the voice command based on the context.

[0012] One or more exemplary embodiments may provide a method for receiving a first voice command associated with a first application from a user.

[0013] One or more exemplary embodiments may provide a method for determining a relationship between the first voice command and a context of at least one historic voice command associated with the first application.

[0014] One or more exemplary embodiments may provide a method for performing at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application.

[0015] One or more exemplary embodiments may provide a method for receiving a second voice command associated with a second application from the user.

[0016] One or more exemplary embodiments may provide a method for determining a relationship between the second voice command and the context of at least one historic voice command associated with the first application.

[0017] One or more exemplary embodiments may provide a method for performing at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0018] According to an aspect of an exemplary embodiment there is provided a method for performing voice based actions by an electronic device, the method including receiving a first voice command from a user, determining a relationship between the first voice command and a context of at least one historic voice command of the user, and performing at least one action by executing the first voice command based on the context.

[0019] According to an aspect of another exemplary embodiment there is provided an electronic device for performing voice based actions, the electronic device including an audio receiver configured to receive a first voice command from a user, and a processor configured to determine a relationship between the first voice command and a context of at least one historic voice command of the user and perform at least one action by executing the first voice command based on the context.

BRIEF DESCRIPTION OF DRAWINGS

[0020] The above and/or other aspects will be more apparent by describing certain exemplary embodiments with reference to the accompanying drawings, in which:

[0021] FIGS. 1A and 1B illustrate an exemplary configuration of an electronic device;

[0022] FIGS. 2A and 2B illustrate another exemplary configuration of an electronic device;

[0023] FIGS. 3A and 3B illustrate yet another exemplary configuration of an electronic device;

[0024] FIGS. 4A and 4B illustrate yet another exemplary configuration of an electronic device;

[0025] FIGS. 5A, 5B, and 5C illustrate yet another exemplary configuration of an electronic device;

[0026] FIGS. 6A and 6B illustrate yet another exemplary configuration of an electronic device;

[0027] FIG. 7 illustrates an electronic device configured to perform one or more voice based actions, according to an exemplary embodiment;

[0028] FIG. 8 illustrates an electronic device configured to perform one or more voice based actions, according to an exemplary embodiment;

[0029] FIG. 9 illustrates a flow diagram of a method for performing the voice based actions by the electronic device, according to an exemplary embodiment;

[0030] FIG. 10 illustrates a flow diagram of a method for performing the voice based actions, according to an exemplary embodiment;

[0031] FIG. 11 illustrates a flow diagram of a method for performing the voice based actions, according to an exemplary embodiment;

[0032] FIGS. 12A and 12B show an example illustration of an electronic device, according to an exemplary embodiment;

[0033] FIGS. 13A and 13B illustrate an example of a method to perform one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0034] FIGS. 14A and 14B illustrate an example of a method to perform one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0035] FIGS. 15A and 15B illustrate an example of a method to perform one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0036] FIGS. 16A and 16B illustrate an example of a method to perform one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0037] FIGS. 17A, 17B, and 17C illustrate an example of a method to perform one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0038] FIGS. 18A and 18B illustrate an example of a method to perform the one or more voice based actions in the electronic device, according to an exemplary embodiment;

[0039] FIGS. 19A and 19B illustrate an example of a method is used to perform one or more voice based actions in the electronic device, according to an exemplary embodiment; and

[0040] FIG. 20 illustrates a computing environment implementing the method and electronic device for performing voice based actions, according to an exemplary embodiment.

DETAILED DESCRIPTION

[0041] Certain exemplary embodiments are described in greater detail below with reference to the accompanying drawings.

[0042] In the following description, like drawing reference numerals are used for like elements, even in different drawings. The matters defined in the description, such as detailed

construction and elements, are provided to assist in a comprehensive understanding of the exemplary embodiments. However, it is apparent that the exemplary embodiments can be practiced without those specifically defined matters. Also, well-known functions or constructions are not described in detail since they would obscure the description with unnecessary detail.

[0043] The various embodiments described herein are not necessarily mutually exclusive, as some exemplary embodiments may be combined with one or more other embodiments to form new embodiments. The term "or" as used herein, refers to a non-exclusive or, unless otherwise indicated. The examples used herein are intended merely to facilitate an understanding of ways in which the embodiments herein can be practiced and to further enable those skilled in the art to practice the embodiments herein. Accordingly, the examples should not be construed as limiting.

[0044] FIGS. 1A and 1B illustrate an exemplary configuration (i.e., screen shot of the electronic device 100) performing one or more functionalities of the related art voice recognition system. The related art voice recognition system may receive a user input (i.e., voice command/ voice query/ voice search query), in a voice based search application or any other application related thereof, such as, "Open Bluetooth". The voice recognition system in the electronic device 100 may process the voice query and provide an output to the voice query provided by the user. As shown in the FIG. 1A, based upon the voice query, the "Bluetooth application" is enabled.

[0045] Further, if the user inputs another voice query, such as "find nearby devices" the voice recognition system may process the voice query and provide an output to the another voice query. As shown in the FIG. 1B, based upon the another voice query, the search application may start searching for the term "find nearby devices", instead of searching/providing the lists of nearby devices via the Bluetooth application.

[0046] In another example as shown in FIG. 2A, if the user inputs via voice command, voice query, and/or voice search query, the first query "brightness", the electronic device 100 may pop-up/display the "brightness slider" of the electronic device 100. Further, if the user inputs second voice query in order to perform any action related to the application (i.e., "the brightness"), the action may performed, such as "increase the brightness level, as shown in FIG. 2B. The electronic device 100 provides no response to the action as requested by the user through the second voice query. Further, there is no support for brightness slider control, thus touch control has to be used.

[0047] In yet another example as shown in FIG. 3A, the user inputs (i.e., first voice input/query, voice command/ voice query/ voice search query) in any of the e-commerce application or any other application related thereof, a first voice query; "white shoes" in the application. The electronic device 100 provides the lists of the "white shoes" available in the application to the user. Further, if the user inputs second user input, such as; "white sports and outdoor shoes" in the application thereto, the application does not provide the output as required by the user through the second user input, as shown in FIG 3B.

[0048] In yet another example as shown in FIG. 4A, the user queries (i.e., first voice query) to open instant messaging (IM) application. The instant messaging application is opened and the voice search ends. Thus, if the user inputs second voice query, such as; "Alison," the electronic device 100 (or, the associated IM application in the electronic device 100) may fail, as shown in FIG. 4B, to fetch the conversation belonging to the "Alison," as requested by the user through the second voice query.

[0049] Yet another example is illustrated in FIGS 5A, 5B, and 5C, in which the user queries (i.e., first query) the current application, with a term "go back" (for example, navigating back to the previously queried term/application). The current application may

therefore start searching for the term "go back" instead of navigating back/going back to a previously queried term/application (if any).

[0050] Yet another example as illustrated in FIGS 6A and 6B, the electronic device might not be able to automatically apply the search query and search filter of "X" application into a "Y" application, whenever the user launches the "Y" application while viewing a content in the "X" application. As a result, the user might have to repeat the search term (i.e., white shoes) and the filters (brand, size, etc.) applied to it, which is redundant.

[0051] Accordingly, one or more exemplary embodiments may provide a method for performing voice based actions by an electronic device. The method includes receiving a voice command from a user. Further, the method includes determining a relationship between the voice command and a context of at least one historic voice command of the user. Furthermore, the method includes performing at least one action by executing the voice command based on the context.

[0052] One or more exemplary embodiments may provide yet another method for performing voice based actions by an electronic device. The method includes receiving a first voice command associated with a first application from a user. Further, the method includes determining a relationship between the first voice command and a context of at least one historic voice command associated with the first application. Further, the method includes performing at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application. Further, the method includes receiving a second voice command associated with a second application from the user, determining a relationship between the second voice command and the context of at least one historic voice command associated with the first application and performing at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0053] One or more exemplary embodiments may provide an electronic device for performing voice based actions. The electronic device includes an audio receiver configured to receive a voice command from a user, a context identification unit configured to determine a relationship between the voice command and a context of at least one historic voice command of the user and a processor configured to perform at least one action by executing the voice command based on the context.

[0054] One or more exemplary embodiments may provide yet another electronic device for performing voice based actions. The electronic device includes an audio receiver configured to receive a first voice command associated with a first application from a user, a context identification unit configured to determine a relationship between the first voice command and a context of at least one historic voice command associated with the first application, a processor configured to perform at least one action by executing the voice command based on the context of at least one historic voice command associated with the first application. Further, the audio receiver configured to receive a second voice command associated with a second application from the user, the context identification unit configured to determine a relationship between the second voice command and the context of at least one historic voice command associated with the first application, and the processor configured to perform at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0055] One or more exemplary embodiments may allow the electronic device to perform automatic context switching based on classification of a natural language query (i.e., without any specific voice command) to be one of a search and an action.

[0056] One or more exemplary embodiments may allow the user to interact intuitively with the electronic device, a completely intangible interaction with the electronic

device especially when hands are not free, as for example while driving, cooking, or exercising.

[0057] One or more exemplary embodiments may allow the electronic device to not only perform the search for the item on the web application/ or any other application related thereof, but also aids in navigating the user, by way of the electronic device, by interacting with the electronic device using the natural language.

[0058] One or more exemplary embodiments may allow the user with multi hop navigation and depth search as opposed to breadth search in most personal assistance software. The proposed method provides a complete Artificial intelligence (AI) based interaction between the user and the electronic device. Thus, providing a two-dimensional (2D) voice search (i.e., multi-hop search, backward navigation, etc.) feature to the user.

[0059] In one or more exemplary embodiments, there is no notion of the electronic device for each state since number of possible states is infinite. Further, the proposed method obviates the necessity to explicitly specify the context by the user, thus making the search process convenient to the user.

[0060] Further, according to the related art method, if the user queries "volume" to see current volume level, thereon, if the user wants to take volume level up/down. The user queries "volume up/down" each time to change volume level up/down. Unlike the related art method, in one or more exemplary embodiments, if the user queries "volume" to see current volume level, the volume slider launches and context ("volume") is stored. The user only uses query "up/down" to take the volume up or down. The user can use keyword "up/down by five" instead of "volume up/down by five" each time.

[0061] Further, in a related art method, if the user queries "open browser" in Television (TV), the browser opens in the TV. And, the user switches to remote for browsing. Unlike the related art method, in one or more exemplary embodiments, when the user queries

"open browser" in the TV, the browser opens in the TV, and then the user browses using voice commands. Thus, in one or more exemplary embodiments, the voice assistance flow is now more intuitive, the user need not repeatedly use long queries since the most recent context is preserved. Navigating TV menu is much easier using voice commands as there is no need to memorize all menu items.

[0062] FIG. 7 illustrates an electronic device 100 for performing one or more voice based actions, according to an exemplary embodiment.

[0063] Referring to FIG. 7, the electronic device 100 may be, for example, a mobile device, a wearable device, a laptop computer, a desktop computer, a smart television, a smart display, a notebook computer, a notebook, a tablet or a mobile device such as a mobile phone, internet of things (IoT), portable media player such as personal music player and personal video player, or any consumer electronic devices capable of transmitting and receiving voice, text, audio, speech, image, or video data. Other forms of data processing device are within the scope of the exemplary embodiments discussed herein.

[0064] The electronic device 100 includes an audio receiver 110, e.g., a microphone, a voice search unit 120 including a context identification unit 126, a processor 130, as for example, a hardware unit, a microprocessor, an apparatus, a Central Processing Unit (CPU), a Graphics Processing Unit (GPU), communicatively coupled to the audio receiver 110, a query construction unit 140, a display 150 (e.g., a Cathode Ray Tube (CRT) display, a Liquid Crystal Display (LCD)), a Light-emitting diode (LED) being interfaced with the processor 130, a memory 160 (e.g., a volatile memory and/or a non-volatile memory) communicatively coupled to the processor 130, a knowledge based unit 170, and a communication unit 180, e.g., a communication interface, a transceiver, etc. The memory 160 may include storage locations configured to be addressable through the processor 130.

[0065] An exemplary embodiment may allow a user to input a voice query (i.e., search query, voice command, etc.) through the user own speech/ utterance and conveniently receive search result data including text, audio, speech, image and video data.

[0066] The audio receiver 110 may include for example, voice recognition system, voice recognition unit, etc. The audio receiver 110 may receive the voice command from the user. The voice command may include for example, an utterance, a voice note, voice speech, a voice text, etc. A speech to text unit (not shown) may be configured to convert the voice command from speech to text and the text may be transmitted to a Query parser unit (not shown).

[0067] The voice search unit 120 includes a Natural Language Understanding (NLU) engine (now shown) and a knowledge base engine (not shown). The NLU engine receives the parsed query from the Query parser unit. Further, the NLU engine classifies the parsed query based on the type of query (search, retrieve or perform another action) and identifies the context of the query. Further, the NLU engine transmit the identified context to the knowledge base engine. The knowledge base engine maps the identified action word to an actual action based on the context of the query.

[0068] The context identification unit 126 is configured to determine the relationship between the voice command and the context of at least one historic voice command of the user. The relationship is determined based on the at least one of the semantic similarity, a latent semantic similarity, and the action performed by each of the historic voice command. The actions are stored in the memory 160, and are executed by the processor 130 by executing the historic voice command.

[0069] The processor 130 is configured to perform the at least one action by executing the voice command based on the context. For example, at least one of the voice search unit 120, the query construction unit 140, and the knowledge based unit 170 may be

included in the processor 130 or may be functional blocks whose functions are executed by the processor 130. In addition, every element in the electronic device 100 is coupled to the processor 130, and may be operated according to a control by the processor. Thus, operations of the elements in the electronic device 100 may be interpreted as operations of the processor 130.

[0070] The query construction unit 140 translates (if required) the NLU command of the user to a machine understandable format to produce the required results.

[0071] In an exemplary embodiment, the audio receiver 110 is configured to receive the first voice command associated with the first application from the user, the context identification unit 126 is configured to determine the relationship between the first voice command and the context of at least one historic voice command associated with the first application, and the processor 130 is configured to perform the at least one action by executing the voice command based on the context of the at least one historic voice command associated with the first application.

[0072] Further, the audio receiver 110 is configured to receive the second voice command associated with the second application from the user, the context identification unit 126 is configured to determine the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, and the processor 130 is configured to perform the at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0073] For example, one or more exemplary embodiments may allow the user to switch the search application along with the provided item, and thus circumvent the user to provide another voice query in order to perform the action/search in the switched search application, as detailed in FIGS. 19A-19B.

[0074] FIG. 8 is an architecture of the electronic device 100 configured to perform one or more voice based actions, according to an exemplary embodiment.

[0075] The audio receiver 110 includes a speech to text unit 112 configured to convert the voice command (received from the user) into the written word/statement. Further, the audio receiver 100 includes a query parser unit 114 configured to translate a search string (i.e., written instructions received from the speech to text unit 112) into specific instructions for the query construction unit 140.

[0076] The query construction unit 140 includes a query generator 142, a query transmitter 144, and a result processing unit 146. The query generator 142 translates (if required) current query to a machine understandable format using the context information. The query transmitter 144 transmits the translated query (in case of a search) to the result processing unit 146. The result processing unit 146 accumulates results/outputs based on the translated query as gathered from the network.

[0077] Voice search unit 120 includes the NLU engine and a knowledge base engine. The NLU engine receives the parsed query from an automatic query parser 122. The automatic query parser 122 is configured to parse the query automatically. Further, the NLU engine classifies the parsed query based on the type of query (search, retrieve or perform another action) and identifies the context of the query. Further, the NLU engine transmit the identified context to the knowledge base engine. The knowledge base engine maps the identified action word to an actual action based on the context of the query.

[0078] Binary classifier 124 is to classify the current command as action or comment.

[0079] Context identification unit 126 is configured to determine the relationship between the voice command and the context of at least one historic voice command of the user. The relationship is determined based on the at least one of the semantic similarity, a latent semantic similarity, and the action performed by each of the historic voice command.

The actions are stored in the memory 160, and are executed by the processor 130 by executing the historic voice command.

[0080] Knowledge based unit 170 maps the identified action word to an actual action based on the context of the query

[0081] Action mapper 172 includes a set of actions, associated with a particular command, to be performed. Based on the command identified, a particular action will be chosen.

[0082] FIG. 9 illustrates a flow diagram illustrating a method for performing the voice based actions by the electronic device 100, according to an exemplary embodiment.

[0083] Referring to FIG. 9, in operation 902, the electronic device 100 receives the voice command from the user. For example, in the electronic device 100, the audio receiver 110 receives the voice command from the user.

[0084] In operation 904, the electronic device 100 determines the relationship between the voice command and the context of at least one historic voice command of the user. For example, the context identification unit 126 determines the relationship between the voice command and the context of at least one historic voice command of the user. If the electronic device 100 determines the relationship then, in operation 906, the electronic device 100 performs the at least one action by executing the voice command based on the context. For example, in the electronic device 100, the processor 130 performs the at least one action by executing the voice command based on the context.

[0085] If the electronic device 100 determines that there is no relationship (i.e., no match) found between the voice command and the context of the at least one historic voice command of the user, in operation 908, the electronic device 100 begins a new context thereupon, and stores it accordingly. For example, in the electronic device 100, the context identification unit 126 begins the new context and stores it accordingly. In operation 910, the

electronic device 100 performs the at least one action by executing the voice command based on the new context. For example, in the electronic device 100, the processor 130 performs the at least one action by executing the voice command based on the context.

[0086] The various actions, acts, blocks, steps, etc., as illustrated in FIG. 9 may be performed in the order presented, in a different order, or simultaneously. Further, in some exemplary embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure.

[0087] FIG. 10 illustrates a flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device 100, according to an exemplary embodiment.

[0088] Referring to FIG. 10, in operation 1002, the electronic device 100 receives the first voice command associated with the first application from the user. For example, in the electronic device 100, the audio receiver 110 receives the first voice command associated with the first application from the user.

[0089] In operation 1004, the electronic device 100 determines the relationship between the first voice command and the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, the context identification unit 126 determines the relationship between the first voice command and the context of the at least one historic voice command associated with the first application.

[0090] If the electronic device 100 determines that there exists the relationship between the first voice command and the context of the at least one historic voice command associated with the first application, then, in operation 1006 the electronic device 100 performs the at least one action by executing the voice command based on the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, the processor 130 performs the at least one action by executing the

voice command based on the context of the at least one historic voice command associated with the first application.

[0091] If the electronic device 100 determines that there is no relationship between the between the first voice command and the context of the at least one historic voice command associated with the first application, then in operation 1008 the electronic device 100 begins the new context associated with the first application. Further, in operation 1010, the electronic device 100 performs the at least one action by executing the voice command based on the new context.

[0092] In operation 1012, the electronic device 100 receives the second voice command associated with the second application from the user. For example, in the electronic device 100, the audio receiver 110 receives the second voice command associated with the second application from the user. In operation 1014, the electronic device 100 determines if there exists any relationship between the second voice command and the context of the at least one historic voice command associated with the first application. For example, in the electronic device 100, the context identification unit 126 determines if there is exists any relationship between the second voice command and the context of the at least one historic voice command associated with the first application.

[0093] If the electronic device 100 determines that there exists the relationship between the second voice command and the context of the at least one historic voice command associated with the first application, then in operation 1016, the electronic device 100 performs the at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application. For example, in the electronic device 100, the processor 130 performs the at least one action by executing the second voice command based on the context of at least one historic voice command associated with the first application.

[0094] If the electronic device 100 determines that there exists no relationship(s) between the second voice command and the context of the at least one historic voice command associated with the first application, then in operation 1018, the electronic device 100 begins a new context associated with the second application. Further, in operation 1020 the electronic device 100 perform the at least one action by executing the voice command based on the new context associated with the second application.

[0095] The various actions, acts, blocks, steps, etc., as illustrated in FIG. 10 may be performed in the order presented, in a different order, or simultaneously. Further, in some exemplary embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure.

[0096] FIG. 11 illustrates yet another flow diagram illustrating a method for performing the voice based actions, based on the one or more voice command associated with one or more applications, by the electronic device 100, according to an exemplary embodiment.

[0097] Referring to FIG. 11, in operation 1102 the electronic device 100 receives the voice query from the user. For example, in the electronic device 100, the audio receiver 110 receives the voice query from the user.

[0098] In operation 1104, the electronic device 100 constructs the query by processing speech to text. For example, in the electronic device 100, the speech to text unit 112 constructs the query by processing speech to text.

[0099] In operation 1106, the electronic device 100 runs the search action classifier. For example, in the electronic device 100, the binary classifier 124 runs the search action classifier.

[0100] In operation 1108, the electronic device 100 determines whether the query is to perform a search or to perform the action. For example, in the electronic device 100, the

binary classifier 124 determines whether the query is the search or the action. For example, as illustrated in FIG. 12A, the search can include launching of related application as per the user voice command (i.e., "open word," the electronic device 100 may launch the word application). Further, as illustrated in FIG. 12A, the action can include "paste the first two sentences" as per the user voice command.

[0101] If the electronic device 100 determines the query as the search, then, in operation 1110, the electronic device 100 begins a new context while considering the query as the search. For example, in the electronic device 100, the context identification unit 126 begins the new context, as detailed in conjunction with FIGS. 19A-19B.

[0102] In operation 1112, the electronic device 100 performs the search using the search query. For example, in the electronic device 100, the Voice search unit 120 performs the search using the search query.

[0103] In operation 1114, the electronic device 100 provides results related to the search query. For example, in the electronic device 100, the result processing unit 146 provides results related to the search query.

[0104] If the electronic device 100, in operation 1108, determines the query as the "Action", then, in operation 1116, the electronic device 100 further determines whether the results related to the action are in the context, as for example, in the context of the voice query. For example, in the electronic device 100, the context identification unit 126 determines whether the results related to the search query are in the context or not.

[0105] If the electronic device 100 determines the results related to the voice query/action is in the context, then, in operation 1118, the electronic device 100 retrieves the most recent context. For example, in the electronic device 100, as illustrated in FIG. 7, the context identification unit 126 retrieves the most recent context.

[0106] If the electronic device 100 determines the results related to the search query are not in the context, then, in operation 1120, the electronic device 100 begins a new context. For example, in the electronic device 100, the context identification unit 126 begins a new context.

[0107] In operation 1122, the electronic device 100 maps the raw action query to the standard action after beginning the new context or after getting the most recent context. For example, in the electronic device 100, the knowledge based unit 170 maps the raw action query to the standard action.

[0108] In operation 1124, the electronic device 100 performs action on the most recent context. For example, in the electronic device 100, the Action mapper 172 performs action on the most recent context.

[0109] In operation 1126, the electronic device 100 provides the results. For example, in the electronic device 100, the result processing unit 146 provides the results.

[0110] The various actions, acts, blocks, steps, etc., as illustrated in FIG. 10 may be performed in the order presented, in a different order, or simultaneously. Further, in some exemplary embodiments, some of the actions, acts, blocks, steps, etc., may be omitted, added, modified, skipped, etc., without departing from the scope of the disclosure

[0111] FIGS. 12A and 12B show an example illustration of the electronic device 100 performing the one or more voice based actions based on the relationship between the voice command and the context of the at least one historic voice command of the user, according to an exemplary embodiment.

[0112] Referring to FIGS. 12A and 12B, the user commences with a user input (i.e., voice query/ voice input query) through a voice command 1202, such as: "copy first 5 sentences" from an application 1214 currently rendered on a display 1230 (similar to the display 150). The context "first 5 sentences" is been stored by the memory 160 coupled to the

context identification unit 126. The application 1214 may be any application having the capability of displaying/providing the content/item therein. The audio receiver 110 may receive the voice command 1202 and may communicate an output (output such as; converting the voice command 1202 from speech to text and the query parser unit 114 to interpret and execute the voice command 1202) to the processor 130 coupled to the context identification unit 126.

[0113] Further, the user may provide a voice command 1204 to the electronic device 100 (i.e., received by the audio receiver 110), such as, "Open Word". The context identification unit 126 may perform latent semantic analysis (LSA) from a corpus of words and supported commands to find the most relevant command that the user might have intended to use. The most relevant application or applications, as for example, a word application 1216, may be launched by the electronic device 1200.

[0114] The context identification unit 126 determines the relationship between the voice command 1204 and the context of the least one historic voice command of the user. The historic voice command, for example, the voice command 1202, and the context, for example, "copy first 5 sentences" and application 1214, associated with the voice command 1202, may be stored in a context cache (or, for example, related context may be saved in the memory 160).

[0115] The processor 130 may perform the action based on the context, such as, launching the word application and/or document 1216 and displaying the same on the display 1230. The context, for example, may now include "copy first 5 sentences," "open word," and the application 1216, and may be stored in the memory 160 associated with the voice command 1204.

[0116] The user may, further, provide a voice command 1206 to the electronic device 100 (i.e., received by the audio receiver 110), such as, "Paste first two sentences" while the

application 1216 is in active state. The context identification unit 126 may determine the relationship between the voice command 1206 and the context of the at least one historic voice command, for example, context associated with the voice command 1202 and the voice command 1204.

[0117] Thus, the processor 130 may perform the action by executing the voice command 1206, such as, "paste the first two sentences" into the "application 1206". The context associated with the voice command 1206 may include "paste the first two sentences", the "application 1206".

[0118] The user yet again, may provide a voice command 1208 to the electronic device 100 (i.e., received by the audio receiver 110), such as, "Open Note". The context identification unit 126 may determine the relationship between the voice command 1208 and the context associated with the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, and the voice command 1206.

[0119] Thus, the processor 130 may perform the action by executing the voice command 1208, such as, "opening of the note application 1218". The context associated with the voice command 1208 may include "open note" and the "note application 1218".

[0120] Further, the user may provide a voice command 1210 to the electronic device 100 (i.e., received by the audio receiver 110), such as, "Paste last three sentences" while the application 1218 is in the active state. The context identification unit 126 may determine the relationship between the voice command 1210 and the context of the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, the voice command 1206, and the voice command 1208.

[0121] Thus, the processor 130 may perform the action by executing the voice command 1210. The action such as, "pasting the last three sentences" in the note application

1218. The context associated with the voice command 1210 is "paste last three sentences" and the "note application 1218" is stored in the memory 160.

[0122] In an exemplary embodiment, the user may provide a voice command 1212 to the electronic device 100 (i.e., received by the audio receiver 110), such as, "Go back to word". The context identification unit 126 may determine the relationship between the voice command 1212 and the context of the at least one historic voice command, for example, context associated with the voice command 1202, the voice command 1204, the voice command 1206, the voice command 1208, and the voice command 1210.

[0123] Based on the context, the processor 130 may perform the action, such as, navigating back to the word application 1216.

[0124] In an exemplary embodiment, the context identification unit 126 may perform latent semantic analysis (LSA) from a corpus of words and supported commands to find the most relevant command that the user might have intended to use. For example, if the voice command is start "application". Thus, the context identification unit 126 may analyze the voice command 1204 and may search the most relevant application using the LSA, as the supported command in the voice command may be open/launch the application. A previous command is necessary to set the context for these commands. The processor 130 may contain a set of rules that will define these parasitic commands and their context search. For example, "Paste" command can only exist if there is a preceding "Copy" command. The rule here would be to search for the most recent "Copy" command in the context cache (or, for example, stored in the memory 160), "Close" command has to be preceded by the "Open" command. The rule here would be to search for the most recent open command in the context cache. "Go back" command without any context should automatically point to the most recent stored context. "Resume" command has to be preceded by a "pause" command. The rule here would be to search for the most recent pause.

[0125] FIGS. 13A and 13B illustrate another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0126] Unlike the related art method discussed above with reference to FIGS. 1A and 1B, if the user, in an exemplary embodiment, queries "Open Bluetooth" to connect to another electronic device, Bluetooth is opened (as shown in FIG. 13A) and context ("Bluetooth") is stored. Further, the user queries "list nearby devices" to get a list of nearby electronic devices (as shown in FIG. 13B). A list of the nearby electronic device is shown and the context is changed to ("Bluetooth", "list of nearby devices").

[0127] FIGS. 14A and 14B illustrate yet another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0128] Unlike the related art method discussed above with reference to FIGS. 2A and 2B, if the user, in an exemplary embodiment, queries "Brightness" to open brightness slider (as shown in FIG.14A), the context ("Brightness") is stored. Further, the user queries "increase brightness" (or "decrease brightness") to change the level of the brightness in the brightness slider (as shown in FIG.14B) and the context is changed to "Brightness", "increase" (or to "Brightness", "decrease").

[0129] FIGS. 15A and 15B illustrate yet another use case scenario in which the method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0130] Unlike the related art method discussed above with reference to FIGS. 3A-3B, the user queries 1502, in an exemplary embodiment, "find white shoes" in the application 1506. The electronic device 100 may provide the user with lists of the "white shoes" available in the application 1506 (as shown in FIG. 15A). Further, if the user queries 1504 "find white

sports shoes and outdoor shoes" in the application 1506, the context identification unit 126 identifies the relationship between the voice command (user query 1504) and the context ("white shoes") of at least one historic voice command (i.e., of a user query 1502). Thus, the processor 130 performs the at least one action by executing the voice command, i.e., a user query 1504, based on the context. The action, such as providing the lists of "white shoes" under the category of outdoor (as shown FIG. 15B). The context identification unit 126 may change the context to ("white shoes" and "outdoor shoes").

[0131] FIGS. 16A and 16B illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0132] Unlike the related art method discussed above with reference to FIGS. 4A-4B, if the user queries 1602, in an exemplary embodiment, an instant messaging (IM) application 1606, the IM application 1606 is opened and context ("IM") is stored in the memory 160. The user queries 1604 "show chat from Alison". The context identification unit 126 identifies the relationship between the voice command (user query 1604) and the context ("IM") of at least one historic voice command (i.e., user query 1602). Thus, the processor 130 performs the at least one action by executing the voice command, i.e., a user query 1604, based on the context. The action, such the chat window for "Alison" is opened and context is updated to ("Instant Messaging", "chat from Alison").

[0133] Further, in an exemplary embodiment, if the user queries "Open Gallery," the gallery is opened and context ("gallery") is stored. If the user further queries "show album," album window for "Alison" is opened and context is updated to "Gallery, Album".

[0134] FIGS. 17A, 17B, and 17C illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0135] Unlike the related art method discussed above with reference to FIGS. 5A, 5B, and 5C, if the user queries 1702 "find shoes in "X" source application 1708 as shown in FIG. 17A, the processor 130 may perform the action by executing the user query 1702 and may display the result (i.e., shoes in X source) on a display 1712 (i.e., display 150). The context "shoes in X" is stored in the memory 160. Further, if the user queries 1704, "Go to "Y" application 1710 (as shown in FIG. 17B), the processor 130 may perform the action by executing the user query 1704. Furthermore, if the user queries 1706, "Go back", the context identification unit 126 may determine the relationship between the user query 1706 and the at least one context of the historic voice command (i.e., voice query 1702 and voice query 1704), thus, the processor 130 may perform the action by executing the user query 1706, such as, navigating back to the application 1708 (as shown in FIG. 17C).

[0136] FIGS. 18A and 18B illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0137] In an example scenario, considering the related art systems, the user while driving wants to go to nearby Chinese restaurant. The user is not sure and wants to see the available options. The user queries "find Chinese restaurant nearby". No result is returned, since navigation application can only navigate to specific locations. Unlike such related art scenarios, in one or more exemplary embodiments, a list of Chinese restaurants in text is returned in response to the user query 1802 from an application 1806 and displayed by the display 1810 (similar to the display 150). The context "Chinese restaurant nearby" is stored in the memory 160. The user likes restaurant "X" and queries (i.e., voice command 1804) "take me to X". The context identification unit 126 determines the relationship between the voice command 1804 and the context associated with the voice command 1804. The processor 130, in response to the relationship determined, may trigger launch of the application 1808 to

navigate the user to the direction corresponding to "X" restaurant from current location of the user.

[0138] FIGS. 19A and 19B illustrate yet another use case scenario in which a method is used to perform the one or more voice based actions in the electronic device 100, according to an exemplary embodiment.

[0139] Unlike the related art method discussed above with reference to FIGS. 6A-6B, the processor 130 may switch the application 1906 (i.e., multiple sources) based on the context of the at least one historic voice command/ queries provided by the user. For example, the audio receiver 110 may receive a first voice command 1902 with a context "show white shoes in X source. Further, the audio receiver 130 may receive a second voice query for applying filters (i.e., size, brand, etc.), the context identification unit 126 may determine a relationship between the second voice command and the context of the first voice command 1902 associated with the application 1906. The processor 130 may execute the first voice command 1902 and display the result obtained therefrom the X source 1906 accompanied with the filters applied within the window (i.e., User Interface) of the X source.

[0140] Further, while the user currently viewing the results of first voice command 1902 within the window of the X source thereof the user may provide a third voice command 1904 with a context "show in Y source," the context identification unit 126 may determine a relationship between the third voice command 1904 and a context of the at least the first voice command 1902 and the second voice command associated with the first application 1906. For example, the context of the term "show" is in relation with the first voice command 1902 and the third voice command 1904.

[0141] The processor 130 may execute the third voice command 1904 with the applied filter (as provided by way of the second voice command) in the Y source 1908 and display the result obtained therefrom the Y source 1908 within the window (i.e., User

Interface) of the Y source, thus, obviating the user to input a new voice query related to the voice query 1902 along with the filters associated therewith. Thus, the queries may be used over multiple sources.

[0142] In the related, the user uses touch to explore the options. The limitation however is that user thought sequence is difficult to capture. Unlike such related art scenarios, in one or more exemplary embodiments, the user queries using voice and the search results are returned in the form of a list. The user further uses voice based depth search commands to explore the content in depth. Thus, in one or more exemplary embodiments, user's thoughts are captured in the form of text which may be used for sequence pattern mining and association rule mining.

[0143] FIG. 20 illustrates a computing environment 2000 implementing the method of electronic device 100 for performing voice based actions, according to an exemplary embodiment. As depicted in FIG. 20, the computing environment 2000 includes at least one processing unit 2004 that is equipped with a control unit 2002 and an Arithmetic Logic Unit (ALU) 2006, a memory 2008, a storage unit 2010, a plurality of networking devices 2014, and a plurality Input output (I/O) devices 2012. The processing unit 2004 is responsible for processing the instructions of the schemes. The processing unit 2004 receives commands from the control unit 2002 in order to perform its processing. Further, any logical and arithmetic operations involved in the execution of the instructions are computed with the help of the ALU 2006.

[0144] The overall computing environment 2000 may be composed of multiple homogeneous or heterogeneous cores, multiple CPUs of different kinds, special media and other accelerators. The processing unit 2004 is responsible for processing the instructions of the schemes. Further, the plurality of processing units 2004 may be located on a single chip or over multiple chips.

[0145] The scheme including of instructions and codes required for the implementation are stored in either the memory 2008 or the storage 2010 or both. At the time of execution, the instructions may be fetched from the corresponding memory 2008 or storage unit 2010, and executed by the processing unit 2004.

[0146] In case of any hardware implementations various networking devices 2014 or external I/O devices 2012 may be connected to the computing environment to support the implementation through the networking unit and the I/O device unit.

[0147] The exemplary embodiments may be implemented through at least one software program running on at least one hardware device and performing network management functions to control the elements. The elements shown in FIGS. 7 through 20 include blocks which may be at least one of a hardware device, or a combination of hardware device and software units.

[0148] The foregoing exemplary embodiments and advantages are merely exemplary and are not to be construed as limiting. The present teaching can be readily applied to other types of apparatuses. Also, the description of the exemplary embodiments is intended to be illustrative, and not to limit the scope of the claims, and many alternatives, modifications, and variations will be apparent to those skilled in the art.

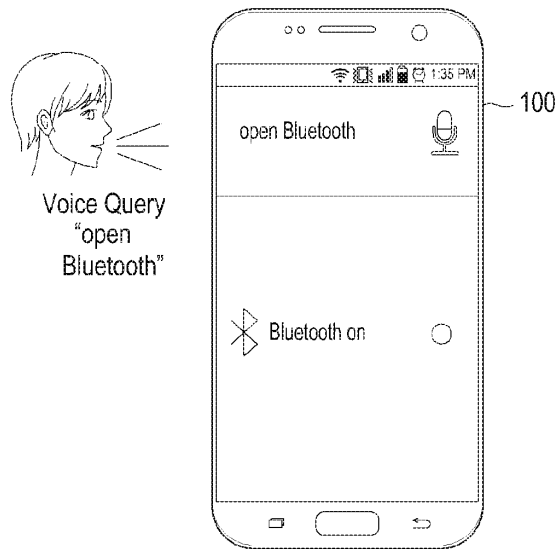


FIG. 1A
(RELATED ART)

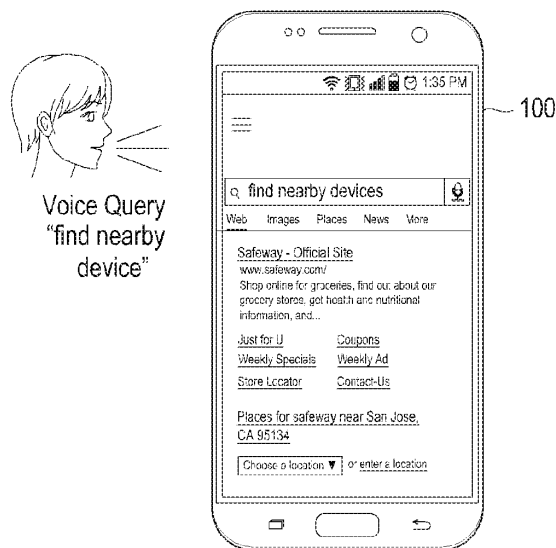


FIG. 1B
(RELATED ART)

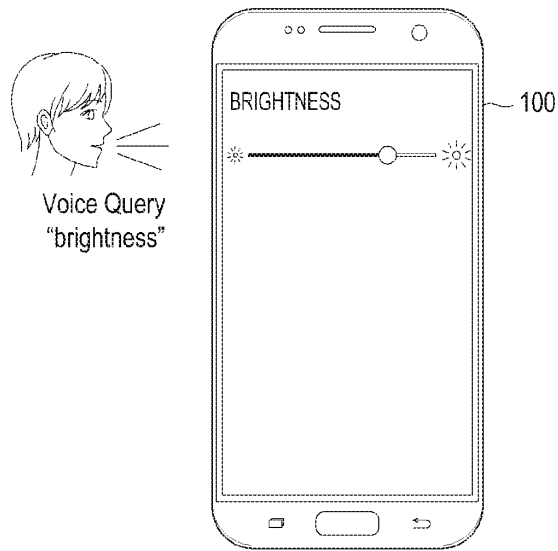


FIG.2A
(RELATED ART)

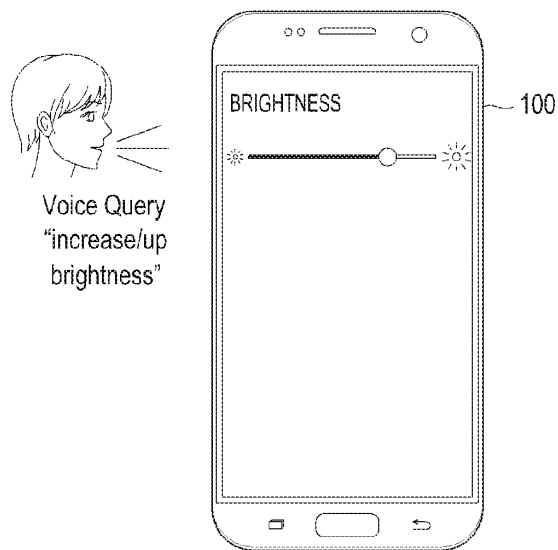


FIG.2B
(RELATED ART)

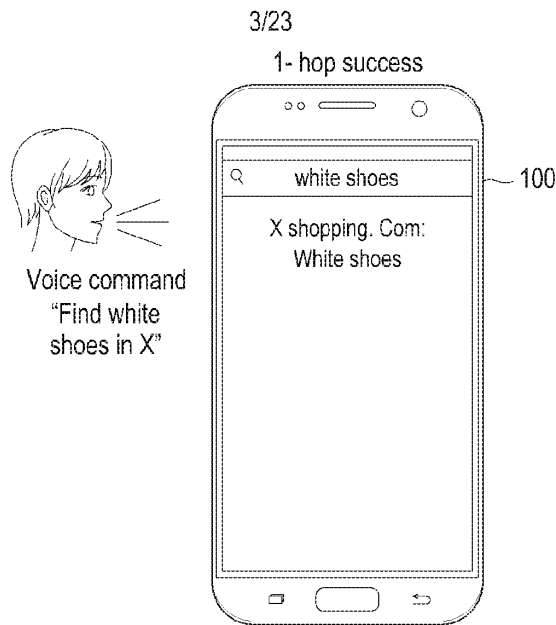


FIG.3A
(RELATED ART)

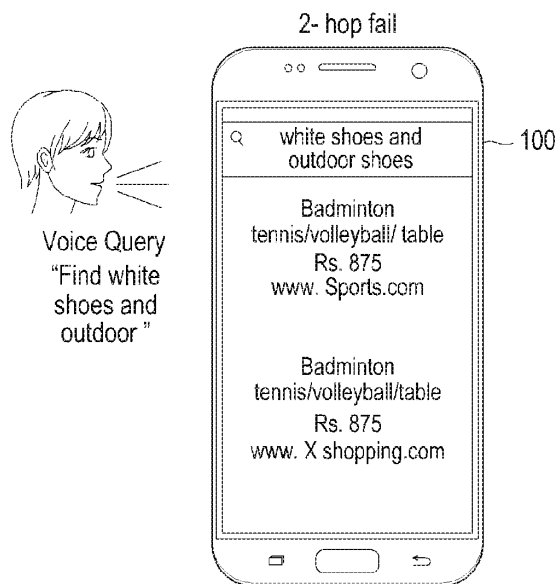


FIG.3B
(RELATED ART)

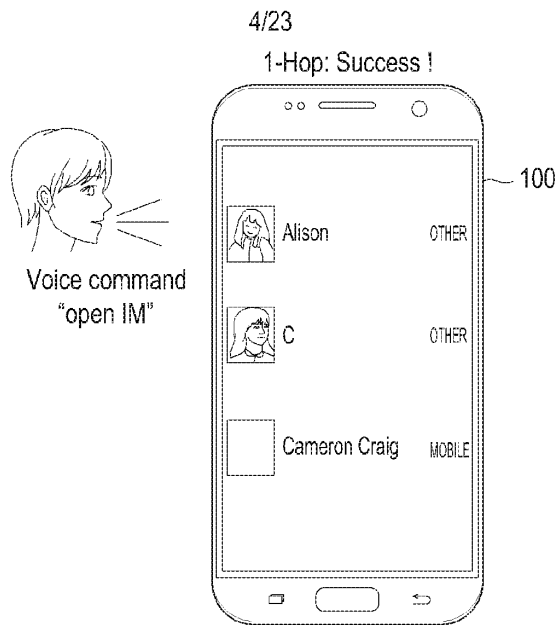


FIG.4A
(RELATED ART)

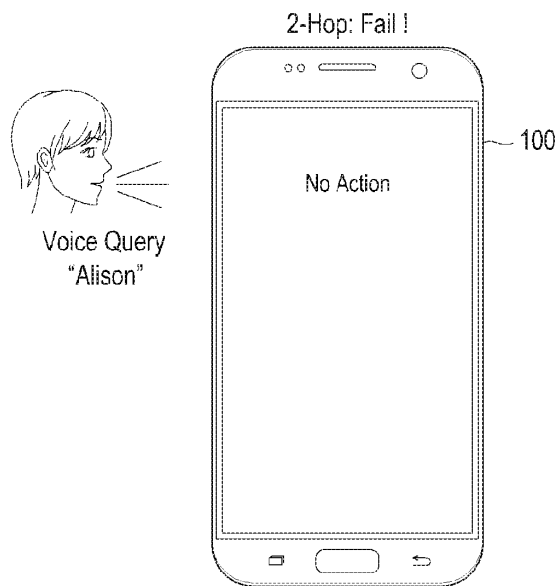


FIG.4B
(RELATED ART)

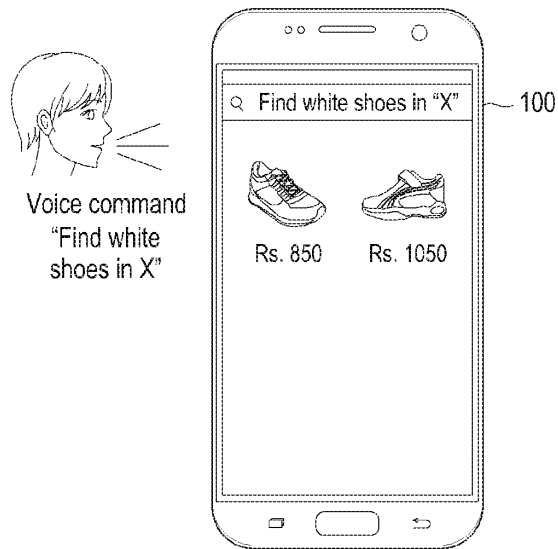


FIG. 5A
(RELATED ART)

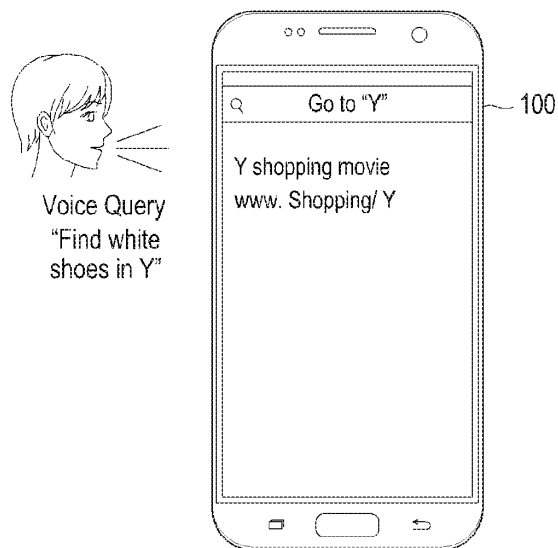


FIG. 5B
(RELATED ART)



FIG.5C
(RELATED ART)

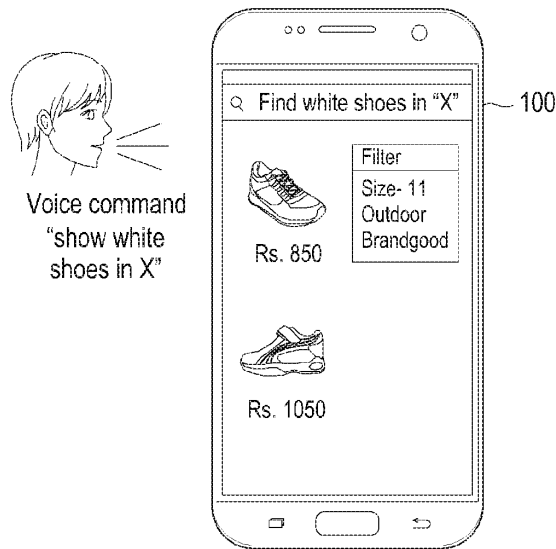


FIG. 6A
(RELATED ART)

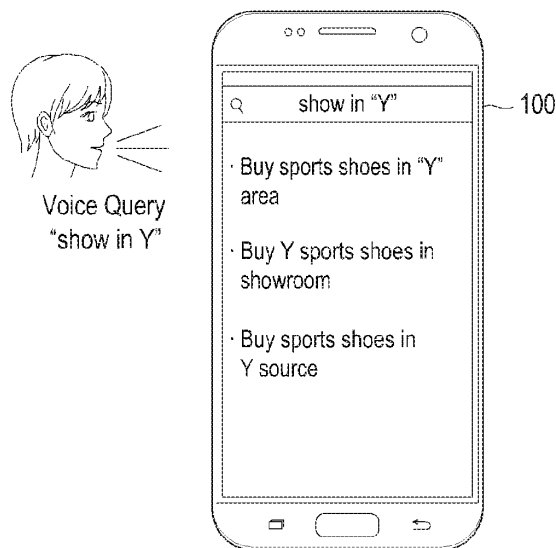


FIG. 6B
(RELATED ART)

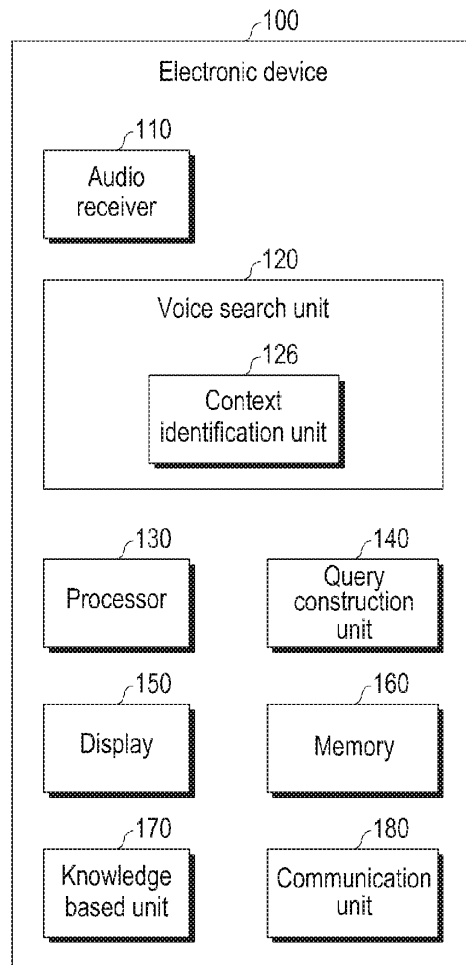


FIG.7

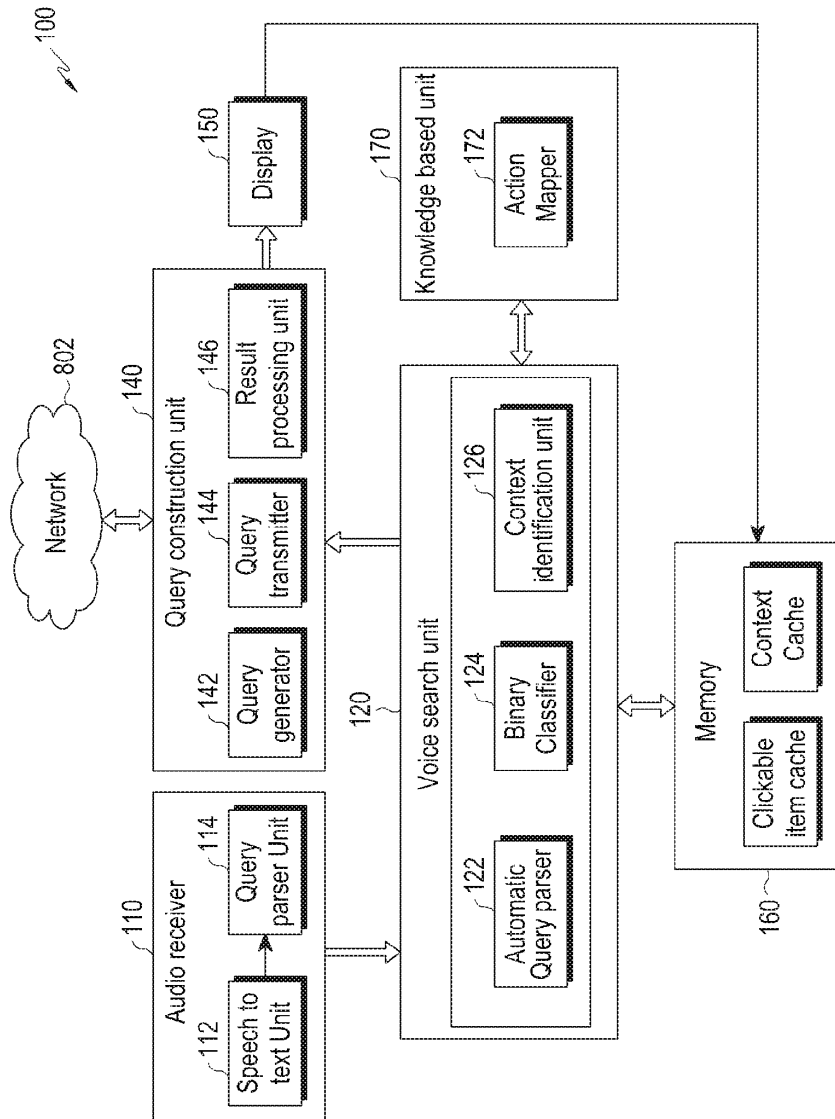


FIG.8

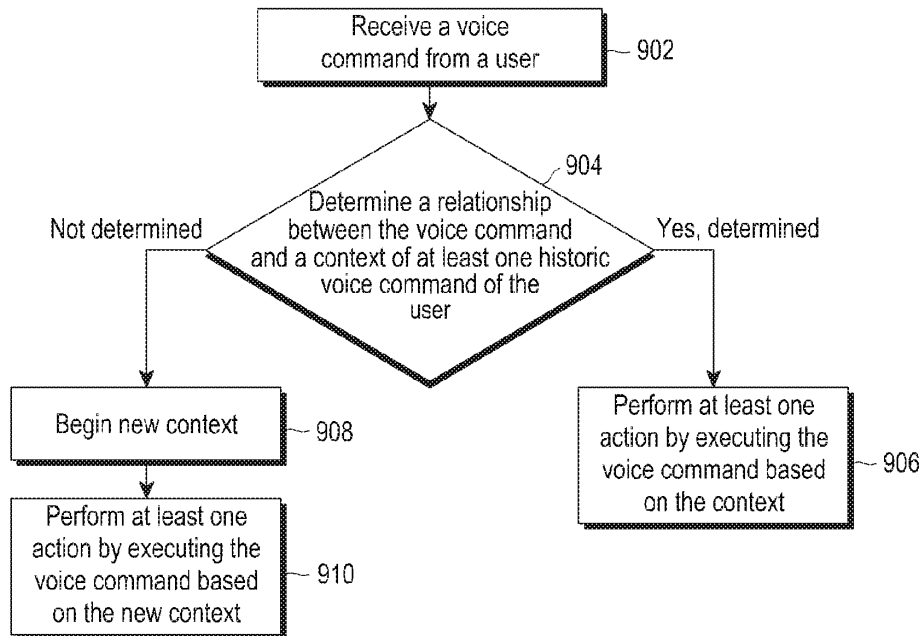


FIG.9

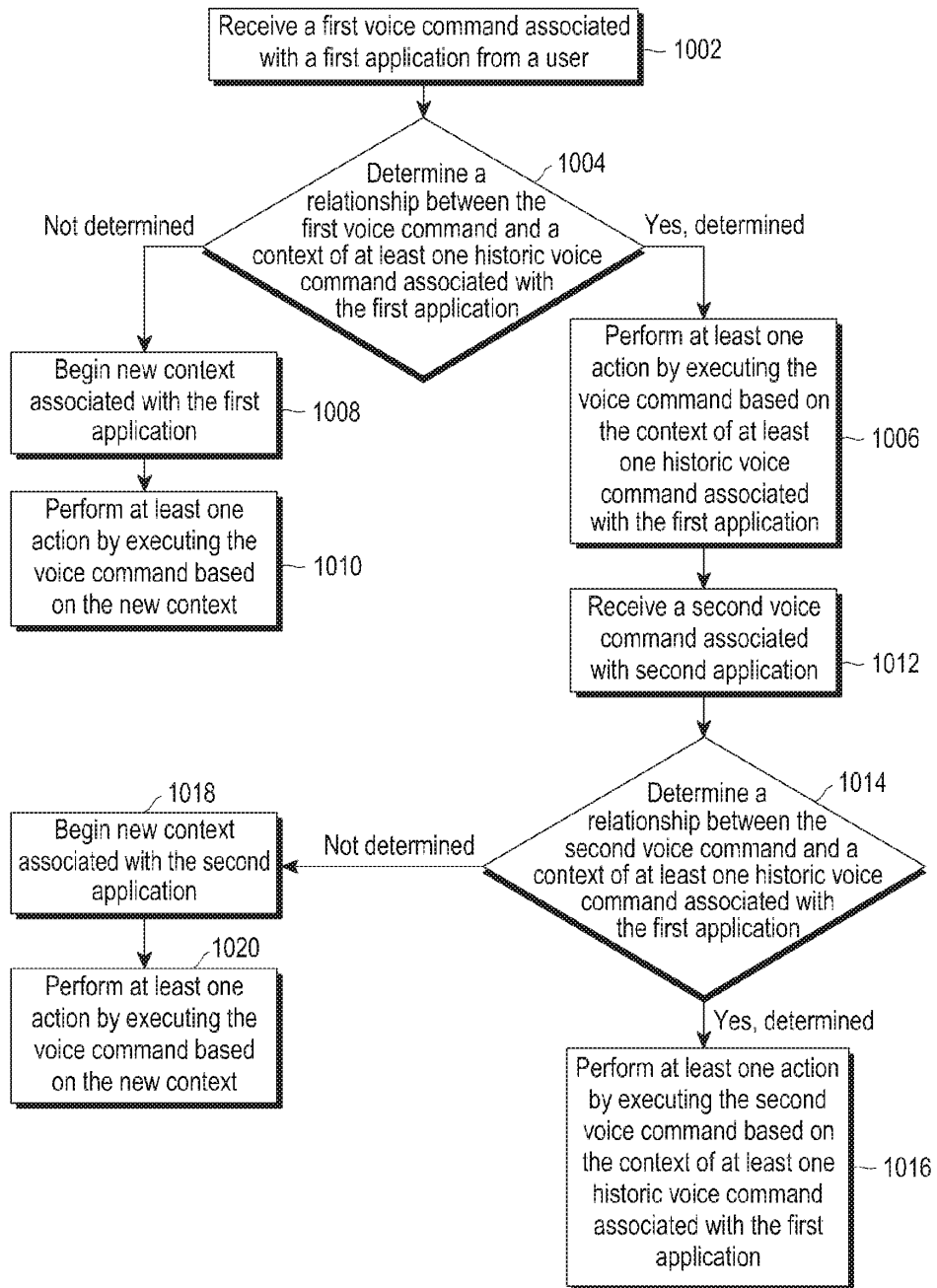


FIG. 10

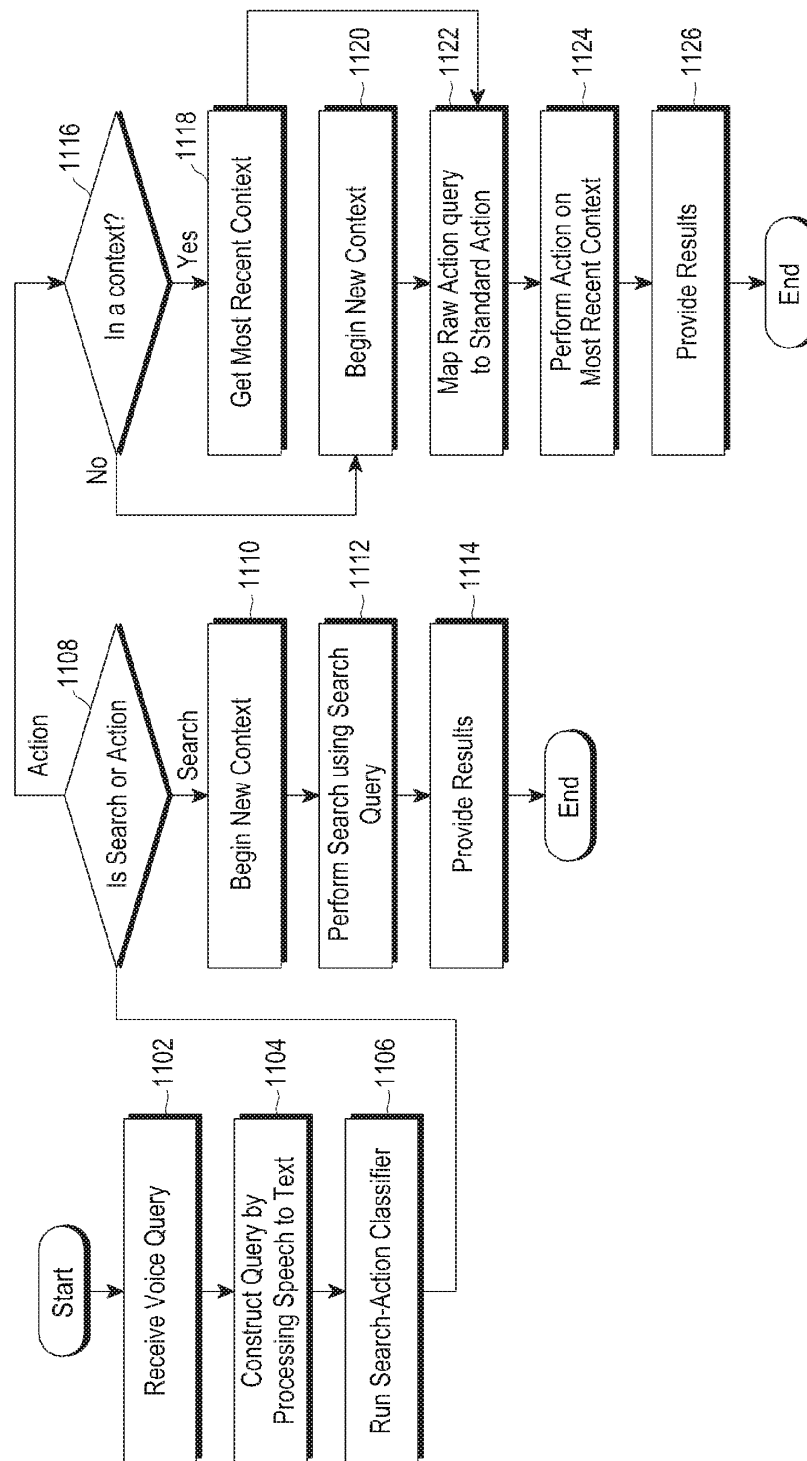


FIG. 11

FIG. 12A

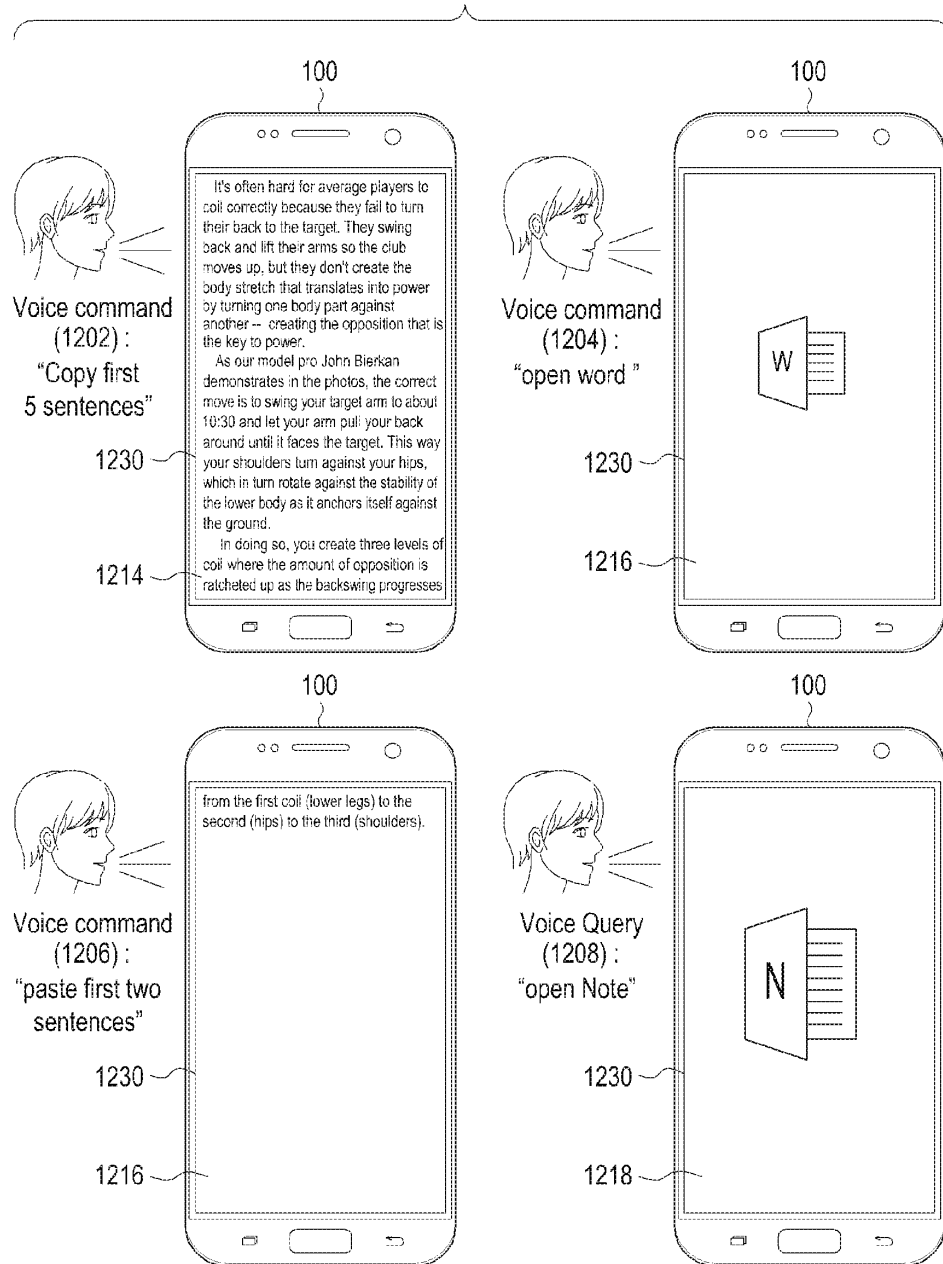


FIG. 12B



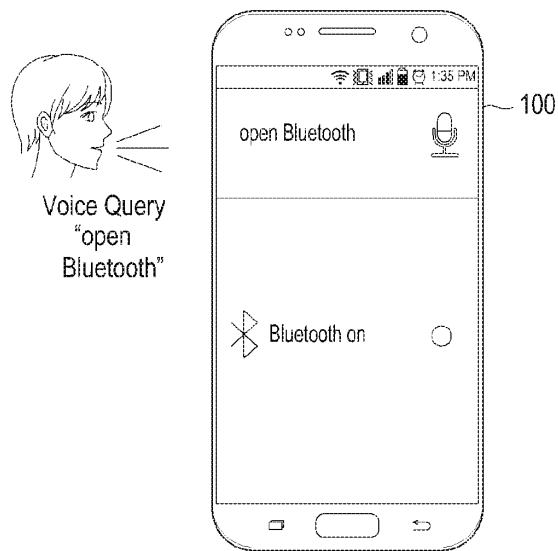


FIG. 13A

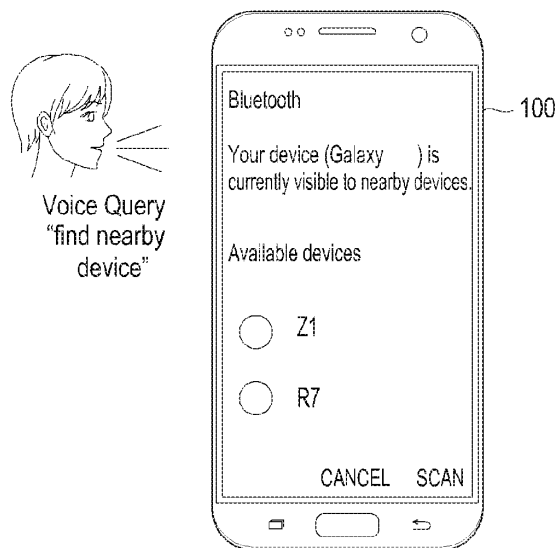


FIG. 13B

16/23

1-Hop : Success

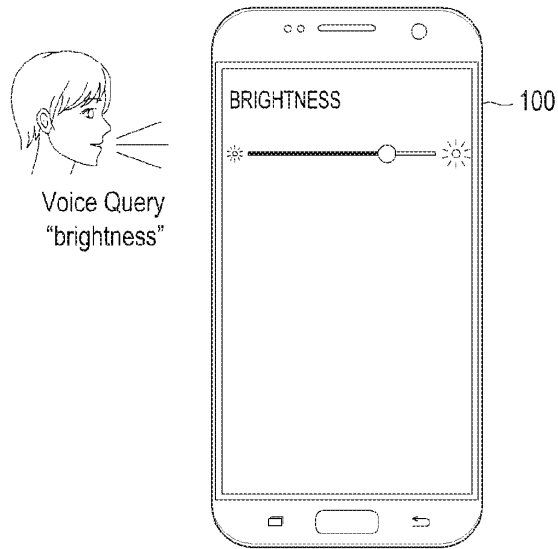


FIG. 14A

2-Hop : Success

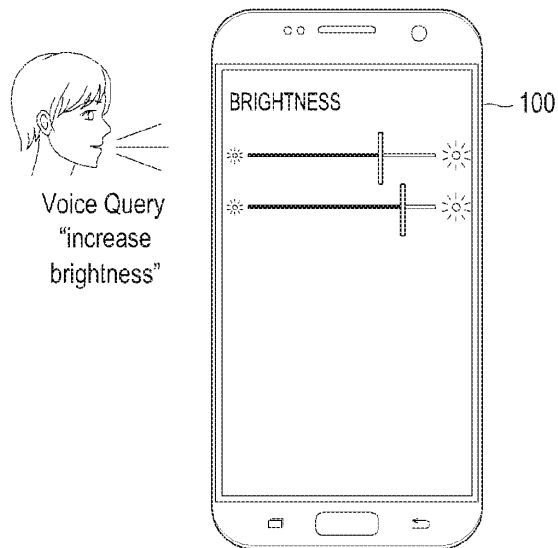


FIG. 14B

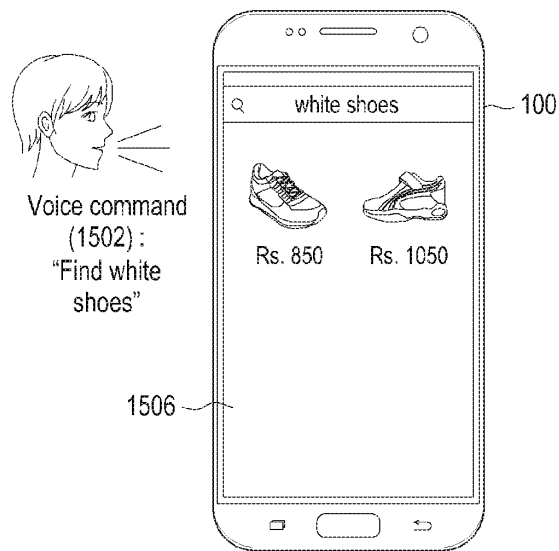


FIG. 15A

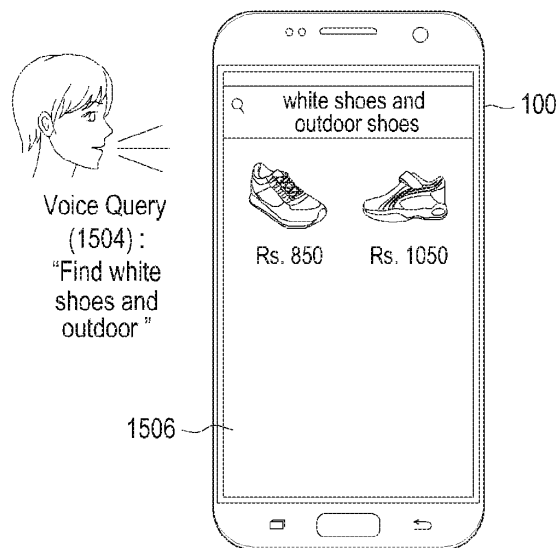


FIG. 15B

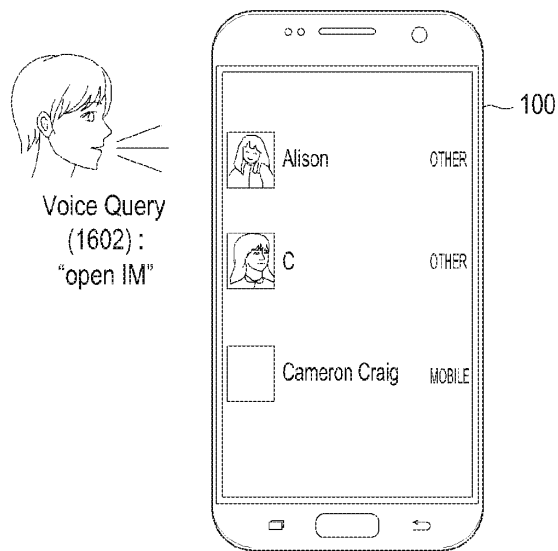


FIG. 16A

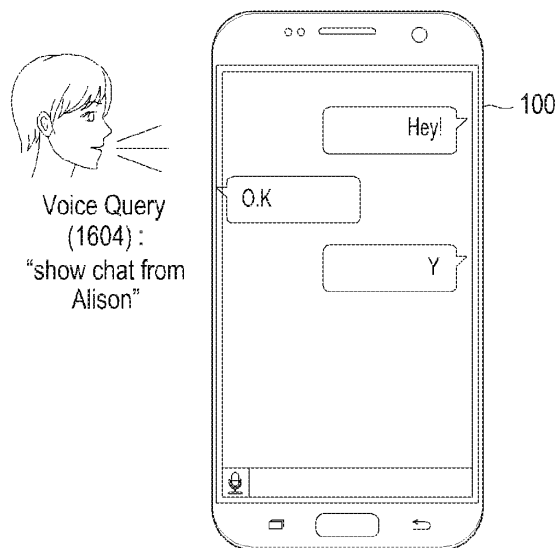


FIG. 16B

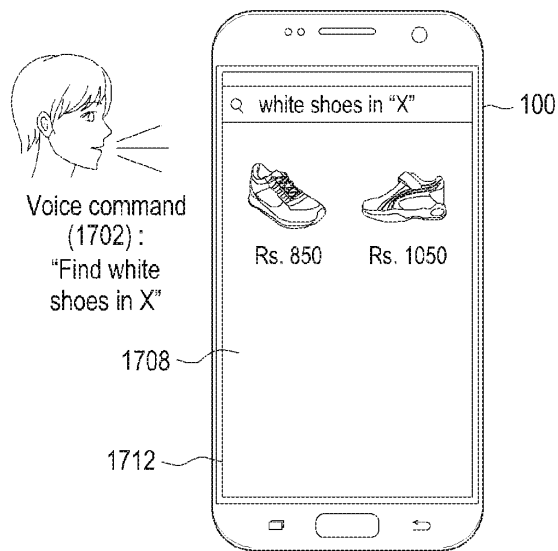


FIG. 17A

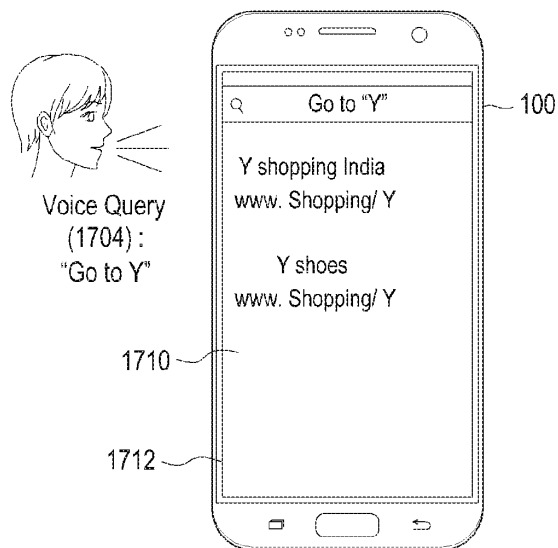


FIG. 17B

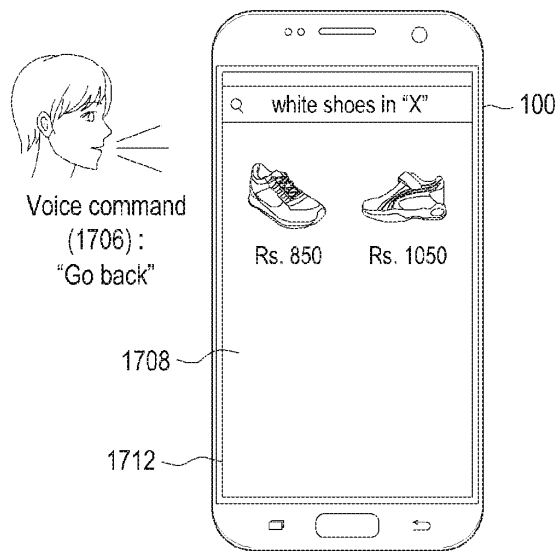


FIG. 17C

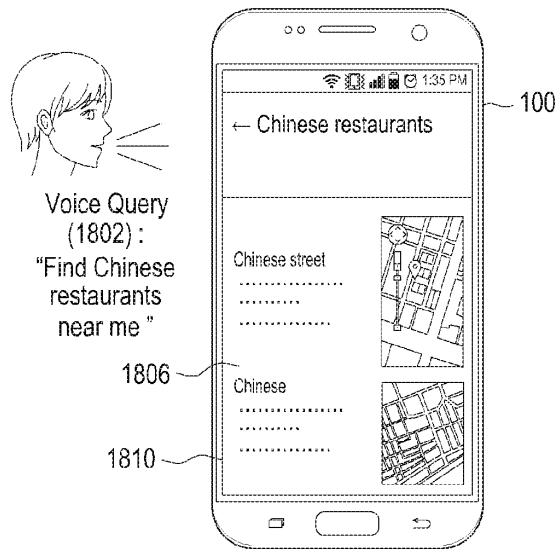


FIG. 18A

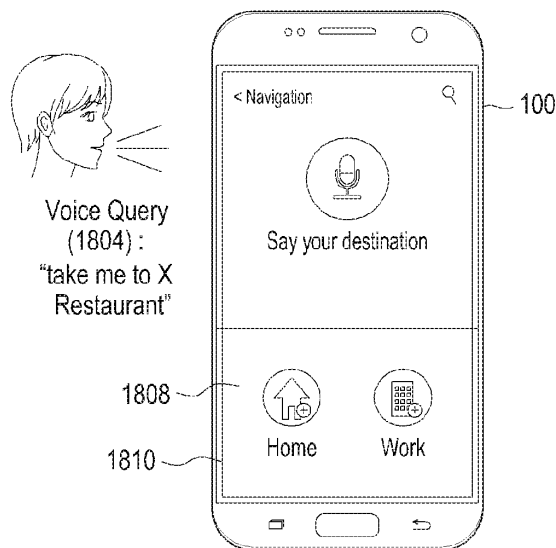


FIG. 18B

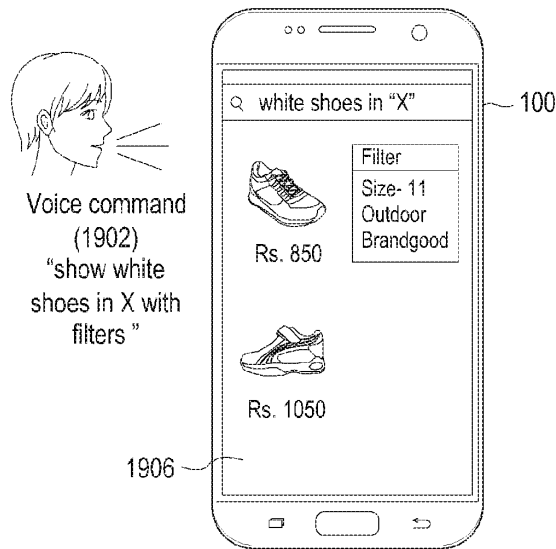


FIG. 19A

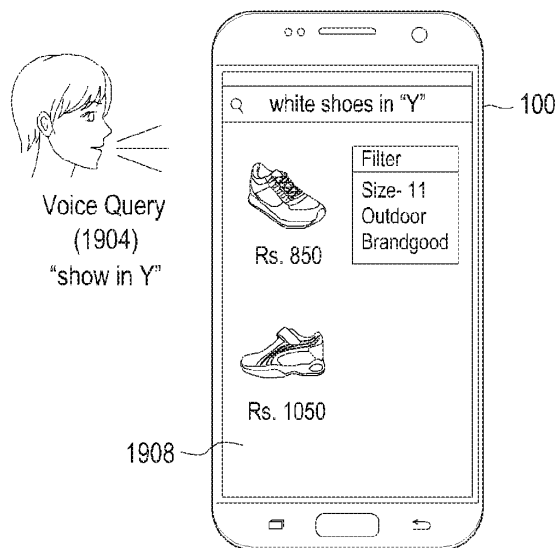


FIG. 19B

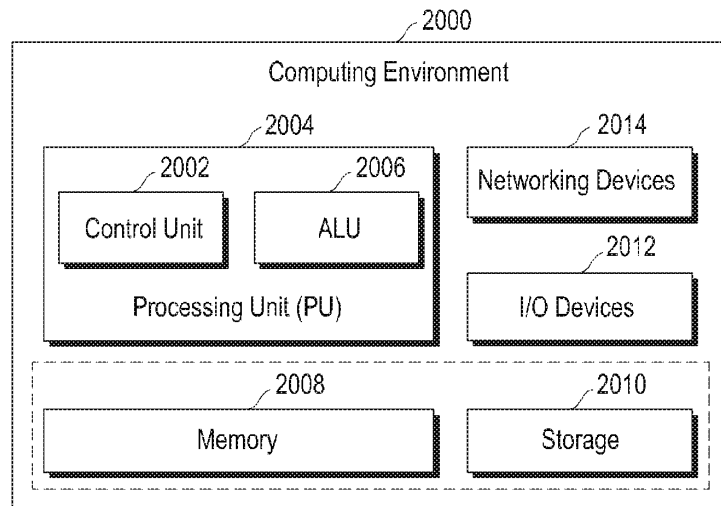


FIG.20

ASSIGNMENT WITH DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

Whereas, We, the undersigned inventors hereinafter called assignors, have invented certain improvements described in the application identified below; and

Whereas, SAMSUNG ELECTRONICS CO., LTD. of 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea, (assignee), desires to acquire the entire right, title, and interest in the application and invention, and to any United States patents to be obtained therefor;

Now therefore, for valuable consideration, receipt whereof is hereby acknowledged,

We, the above named assignors, hereby sell, assign and transfer to the above named assignee, its successors and assigns, the entire right, title and interest in the application and the invention disclosed therein for the United States of America and all other countries, including all divisions, and continuations thereof, and all Letters Patent of the United States that may be granted thereon, and all reissues thereof, and including rights of priority under the International Convention of Paris (1883) as amended, the laws of all foreign countries, and the laws of the United States including the right to claim priority under 35 USC 119 and the right to sue for past damages, and we request the Director of the U.S. Patent and Trademark Office to issue any Letters Patent granted upon the invention set forth in the application to the assignee, its successors and assigns; and we hereby agree that the assignee may apply for foreign Letters Patent on the invention and we will execute without further consideration all papers deemed necessary by the assignee in connection with the United States and foreign applications when called upon to do so by the assignee.

(Legalization not required for recording but is prima facie evidence of execution under 35 USC 261)

As the below named inventor, I hereby declare that:

This assignment with declaration is ☒ The attached application, or directed to:

☐ United States Application or PCT International Application Number _____
filed on _____.

The application is entitled:

METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS

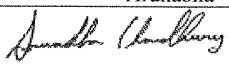
The above identified application was made or was authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I have reviewed and understand the contents of the application for which this assignment with declaration is being submitted.

I am aware of the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 CFR 1.56.

I hereby acknowledge that any willful false statement made in this assignment with declaration is punishable under 18 USC 1001 by fine or imprisonment of not more than five (5) years, or both.

NAME OF SOLE OR FIRST INVENTOR:		
Given Name (first and middle [if any])	Arunabha	Family Name or Surname CHOUDHURY
Inventor's signature		Date 8 Feb. 2017
Residence: Bangalore, India		
Mailing Address: #2870, ORION Building, Bagmane Constellation Business Park, Outer Ring Road, Doddanekundi Circle, Marathahalli Post, Bangalore-560037, India		
NAME OF SECOND INVENTOR:		
Given Name (first and middle [if any])	Sriram	Family Name or Surname NAGASWAMY
Inventor's signature		Date 2/8/2017
Residence: Bangalore, India		
Mailing Address: #2870, ORION Building, Bagmane Constellation Business Park, Outer Ring Road, Doddanekundi Circle, Marathahalli Post, Bangalore-560037, India		

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1	Remove		
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Arunabha		CHOUDHURY	
Residence Information (Select One)				US Residency ☐ Non US Residency ☒ Active US Military Service ☐
City	Bangalore	Country of Residence ⁱ	IN	
Mailing Address of Inventor:				
Address 1	#2870, ORION Building, Bagmane Constellation			
Address 2	Business Park,Outer Ring Road, Doddanekundi Circle			
City	Marathahalli Post, Bangalore	State/Province		
Postal Code	560037	Country ⁱ	IN	
Inventor	2	Remove		
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Sriram		NAGASWAMY	
Residence Information (Select One)				US Residency ☐ Non US Residency ☒ Active US Military Service ☐
City	Bangalore	Country of Residence ⁱ	IN	
Mailing Address of Inventor:				
Address 1	#2870, ORION Building, Bagmane Constellation			
Address 2	Business Park,Outer Ring Road, Doddanekundi Circle			
City	Marathahalli Post, Bangalore	State/Province		
Postal Code	560037	Country ⁱ	IN	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.				
Add				

Correspondence Information:

EFS Web 2.2.11

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	23373		
Email Address	sughrue@sughrue.com	<input type="button" value="Add Email"/>	<input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
Attorney Docket Number	Q231458	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	23	Suggested Figure for Publication (if any)	

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)	
☐	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	23373		

EFS Web 2.2.11

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status	<input type="text"/>	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
<input type="text"/>	<input type="text"/>		
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button. <input type="button" value="Add"/>			

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

<input type="button" value="Remove"/>			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
201641004997	N	2016-02-12	
<input type="button" value="Remove"/>			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
201641004997	N	2016-12-05	
Additional Foreign Priority Data may be generated within this form by selecting the Add button. <input type="button" value="Add"/>			

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

<p>This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.</p> <p>☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.</p>
--

Authorization to Permit Access:

<p>☒ Authorization to Permit Access to the Instant Application by the Participating Offices</p> <p>If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.</p> <p>In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.</p> <p>In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.</p>
--

Applicant Information:

<p>Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.</p>
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		

Applicant	1 Remove		
<p>If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.</p> <p style="text-align: right;">Clear</p>			
☐ Assignee	Legal Representative under 35 U.S.C. 117		Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
Name of the Deceased or Legally Incapacitated Inventor : <div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
If the Applicant is an Organization check here. ☒			
Organization Name	SAMSUNG ELECTRONICS CO., LTD.		
Mailing Address Information For Applicant:			
Address 1	129, Samsung-ro, Yeongtong-gu, Gyeonggi-do		
Address 2			
City	Suwon-si	State/Province	
Country	KR	Postal Code	16677
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.	
Assignee	1 Remove
<p>Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.</p>	
If the Assignee or Non-Applicant Assignee is an Organization check here. ☒	

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	Q231458
		Application Number	
Title of Invention	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		

Organization Name	SAMSUNG ELECTRONICS CO., LTD.		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	129, Samsung-ro, Yeongtong-gu, Gyeonggi-do		
Address 2			
City	Suwon-si	State/Province	
Country i	KR	Postal Code	16677
Phone Number		Fax Number	
Email Address			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. <input type="button" value="Add"/>			

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Christopher R. Lipp/			Date (YYYY-MM-DD)	2017-02-10
First Name	Christopher R.	Last Name	Lipp	Registration Number	41157
Additional Signature may be generated within this form by selecting the Add button. <input type="button" value="Add"/>					

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
First Named Inventor/Applicant Name:		Arunabha CHOUDHURY		
Filer:		Christopher Robert Lipp/Ziriatou Amadou		
Attorney Docket Number:		Q231458		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1600

Electronic Acknowledgement Receipt	
EFS ID:	28323865
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Customer Number:	23373
Filer:	Christopher Robert Lipp/Ziriatou Amadou
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	10-FEB-2017
Filing Date:	
Time Stamp:	15:04:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1600
RAM confirmation Number	021317INTEFSW15050300
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	Q231458Transmittal.pdf	45103	no	1
			0d3d524da8c221d1909d0e7785dca8c980e3447d		
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	Q231458FeeTransmittal.pdf	39232	no	1
			4adcc160dbafe6c78ad4763762ac7c2458fa708		
Warnings:					
Information:					
3		Q231458specificationtobefiled.pdf	142729	yes	36
			2a999673d4a0ea24a3b2f2ca7837a226685a2a19		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		36	36	
	Claims		30	35	
	Specification		1	29	
Warnings:					
Information:					
4	Drawings-only black and white line drawings	Q231458drawingstobefiled.pdf	1470737	no	23
			7f8c24b1be887df85bdc4569308fbc4f7d28099e7		
Warnings:					
Information:					
5	Oath or Declaration filed	Q231458DecAssexecuted.pdf	145753	no	2
			588014780f65e624f68db2614bb8f3fc42d5d420		

Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
6	Application Data Sheet	Q231458ADS.pdf	1560984	no	7
			d4b0ea64448fd0eae10779e8038d73ac75327e65		
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	35300	no	2
			0ea8c1e4c05a81f5243ad9b084777b5516da3c5f		
Warnings:					
Information:					
Total Files Size (in bytes):			3439838		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS			
NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.			
Application Number	15/429,715		
Filing Date	February 10, 2017		
First Named Inventor	Arunabha CHOUDHURY		
Title	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS		
Art Unit	Not Yet Assigned		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	Q231458		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/Christopher R. Lipp/	Date (Optional)	February 10, 2017
Name	Christopher R. Lipp	Registration Number	41,157
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☒ *Total of <u>1</u> forms are submitted.			

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

- ☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

23373

OR

- ☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

- ☒ The address associated with the above-mentioned Customer Number.

OR

- ☐ The address associated with Customer Number:

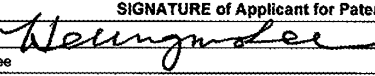
OR

☐ Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

I am the Applicant:

- ☐ Inventor or Joint Inventor
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor
☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature		Date	2012.10.11
Name	Heungmo Lee	Telephone	+82-31-279-4761
Title and Company	Vice President, Samsung Electronics Co., Ltd.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

- ☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt	
EFS ID:	28325372
Application Number:	15429715
International Application Number:	
Confirmation Number:	5067
Title of Invention:	METHOD AND ELECTRONIC DEVICE FOR PERFORMING VOICE BASED ACTIONS
First Named Inventor/Applicant Name:	Arunabha CHOUDHURY
Correspondence Address:	SUGHRUE MION, PLLC - 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON DC 20037 US 202-293-7060 PPROCESSING@SUGHRUE.COM
Filer:	Christopher Robert Lipp/Ziriatou Amadou
Filer Authorized By:	Christopher Robert Lipp
Attorney Docket Number:	Q231458
Receipt Date:	10-FEB-2017
Filing Date:	
Time Stamp:	15:18:24
Application Type:	Utility under 35 USC 111(a)
Payment information:	
Submitted with Payment	no
File Listing:	

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	Q231458TransmittalforPOA.pdf	880027	no	2
			7880fcc90c864974515da98a9fe80d1cc966ca3		
Warnings:					
Information:					
Total Files Size (in bytes):			880027		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					