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(12) **Reissued Patent**

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(54) **VOICE INTERACTION METHOD, AND DEVICE**

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(73) Assignee: **PANASONIC INTELLECTUAL PROPERTY CORPORATION OF AMERICA**, Torrance, CA (US)

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Related U.S. Patent Documents

Reissue of:

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PCT No.: **PCT/JP2014/003097**
§ 371 (c)(1),
(2) Date: **Sep. 17, 2015**
PCT Pub. No.: **WO2014/203495**
PCT Pub. Date: **Dec. 24, 2014**

U.S. Applications:

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(51) **Int. Cl.**
G10L 15/00 (2013.01)
G10L 21/00 (2013.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G10L 15/22*** (2013.01); ***G06F 3/167*** (2013.01); ***G10L 15/08*** (2013.01); ***G10L 15/222*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G06F 3/167; G10L 15/08; G10L 15/22; G10L 15/222; G10L 15/32; G10L 2015/088
See application file for complete search history.

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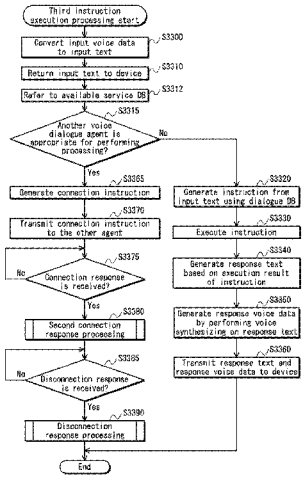
(Continued)

Primary Examiner — Rachna S Desai
(74) *Attorney, Agent, or Firm* — Wenderoth, Lind & Ponack, L.L.P.

(57) **ABSTRACT**

A voice dialogue method performed by a voice dialog system includes: a voice signal generation unit; a voice dialog agent unit; a voice output unit; and a voice input control unit, the method including: a step of, by the voice signal generation unit, receiving a voice input and generating a voice signal based on the received voice input; a step of, by the voice dialog agent unit, performing voice recognition processing on the voice signal and performing processing based on a result of the voice recognition processing to generate a response signal; a step of, by the voice output unit, outputting a voice based on the response signal; and a step of, when the voice output unit outputs the voice, by the
(Continued)



voice input control unit, keeping the voice signal generation unit, for predetermined period after output of the voice, a receivable state in which a voice input is receivable.

9 Claims, 44 Drawing Sheets

(51) **Int. Cl.**

G10L 15/22	(2006.01)
G06F 3/16	(2006.01)
G10L 15/08	(2006.01)
G10L 15/32	(2013.01)

(52) **U.S. Cl.**
CPC ***G10L 15/32*** (2013.01); *G10L 2015/088* (2013.01)

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Office Action issued Jun. 1, 2018 in Chinese Application No. 201480021678.6 (with English translation of Search Report).
Lin et al., (1999). "A distributed architecture for cooperative spoken dialogue agents with coherent dialogue state and history." In: Proc. Workshop Automatic Speech Recognition and Understanding.*

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FIG. 1

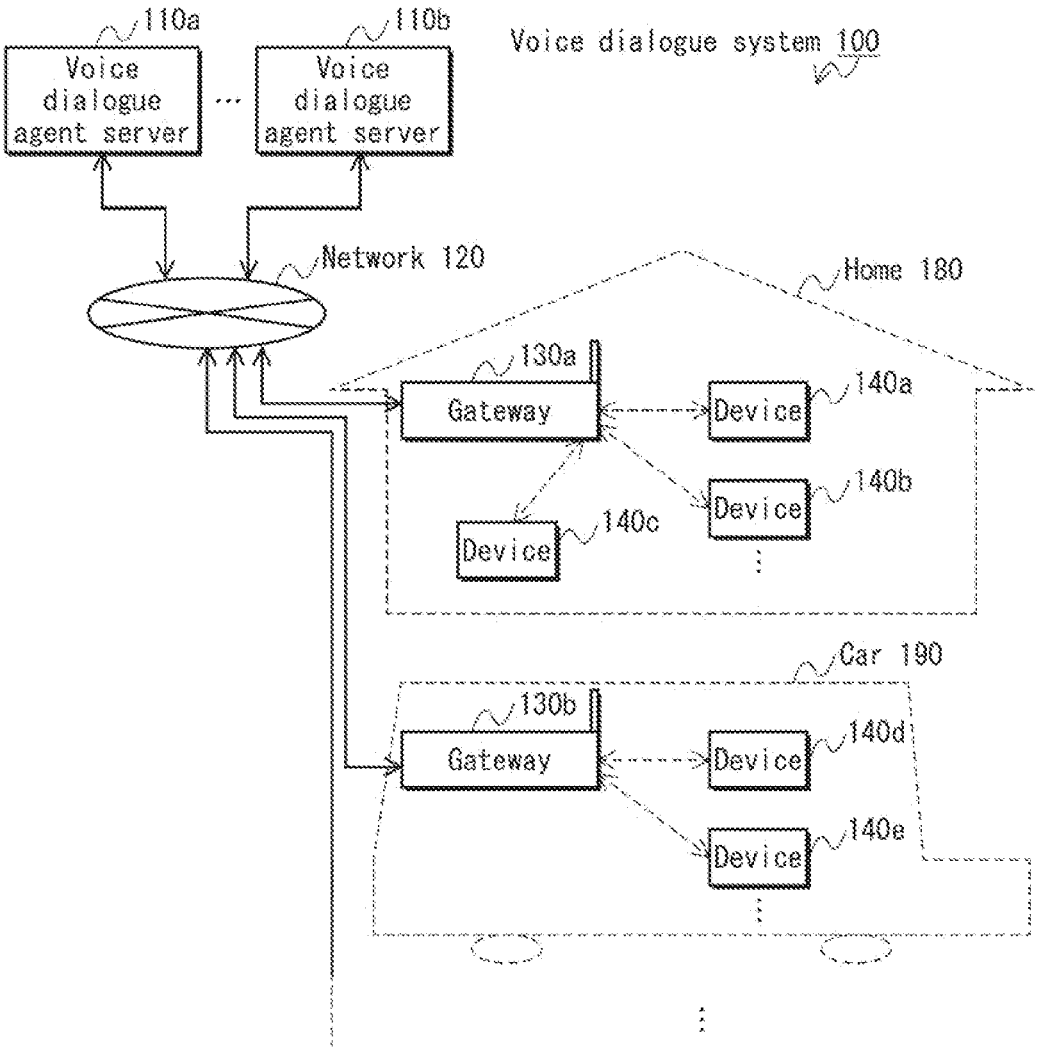

110a
Voice dialogue agent server
110b
Voice dialogue agent server
Voice dialogue system 100
Network 120
Home 180
130a
Gateway
140a
Device
140b
Device
140c
Device
Car 190
130b
Gateway
140d
Device
140e
Device

FIG. 2

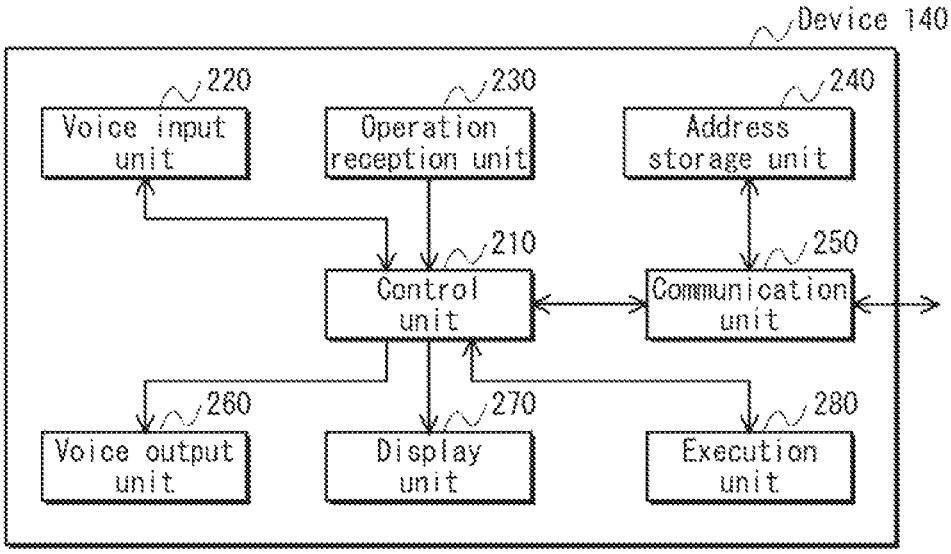

Device 140
220
Voice input unit
230
Operation reception unit
240
Address storage unit
210
Control unit
250
Communication unit
260
Voice output unit
270
Display unit
280
Execution unit

FIG. 3

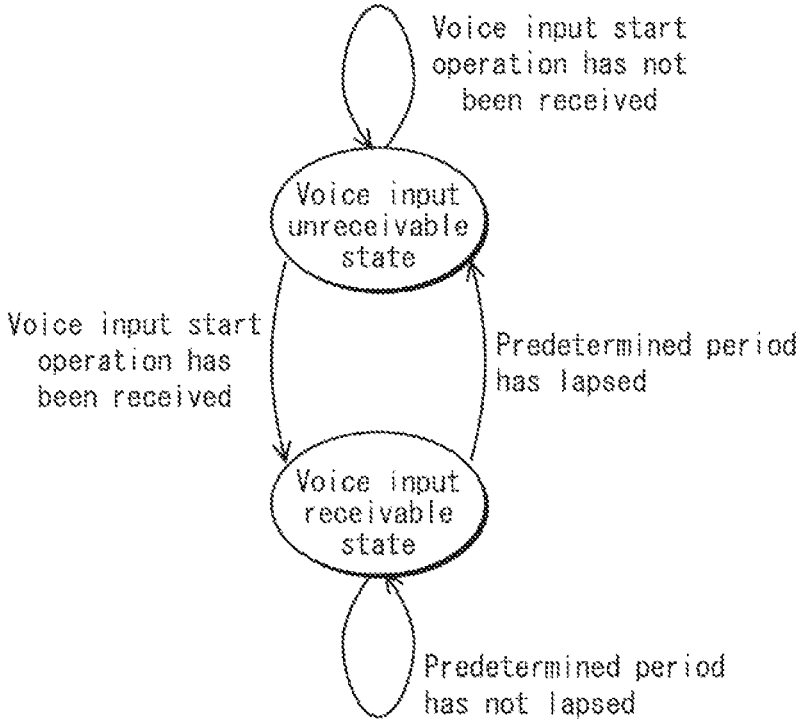

Voice input start operation has not been received
Voice input unreceivable state
Voice input start operation has been received
Predetermined period has lapsed
Voice input receivable state
Predetermined period has not lapsed

FIG. 4

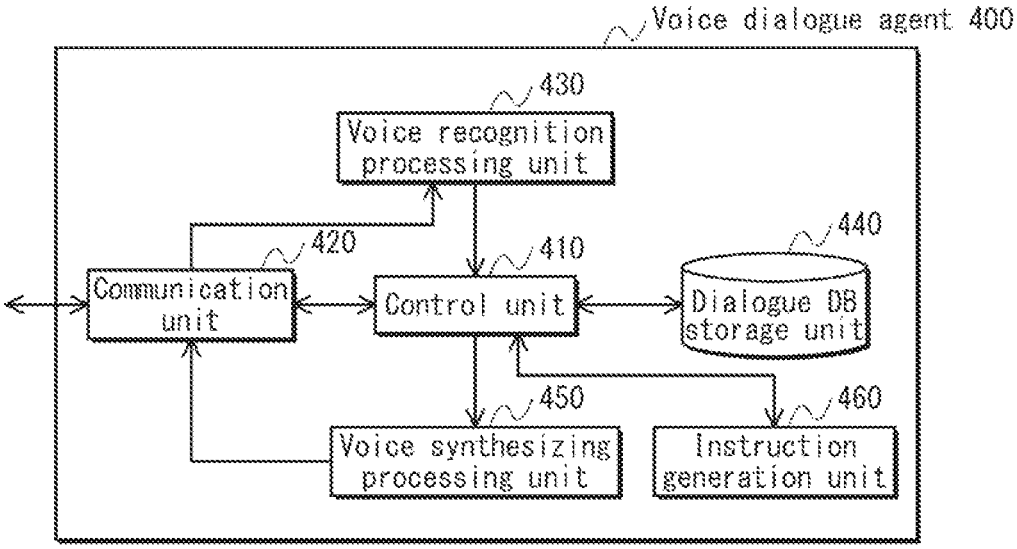

Voice dialogue agent 400
430
Voice recognition processing unit
420
410
440
Communication unit
Control unit
Dialogue DB storage unit
450
460
Voice synthesizing processing unit
Instruction generation unit

FIG. 5

Dialogue DB 500

510 Keyword	520 Target device	530 Startup application	540 Processing details	550 Response text
What is Mr. XX's address (birthday/phone number)?	Smartphone	Contact information	Check Mr. XX's address (birthday/phone number)	Mr. XX's address (birthday/phone number) is YY.
Make call to Mr. XX	Smartphone	Phone	Make call to Mr. XX	Call to Mr. XX is made.
Play back XX	Smartphone	Music	Play back XX	XX is playing back.
Send message to Mr. XX	Smartphone	Message	Send message to Mr. XX	Message is sent to Mr. XX.
Set XX for YY o'clock	Smartphone	Calendar	Set XX for YY o'clock	XX is set for YY o'clock.
Remind XX	Smartphone	Reminder	Set XX in reminder	XX is set in reminder.
Check mail	Smartphone	Mail	Check mail	Mail is checked.
What is weather (forecast) of XX?	Smartphone	Weather	Check weather (forecast)	Weather (forecast) of XX is YY.
What is stock price of XX?	Smartphone	Stock price	Check stock price of XX	Stock price of XX is YY.
Wake up at XX o'clock, set alarm for XX o'clock	Smartphone	Timer	Set alarm for XX o'clock	Alarm is set for XX o'clock.
Note XX	Smartphone	Memo	Note XX in notepad	XX is noted in notepad.
Check XX, search for XX	Smartphone	Web search	Search for XX on Web and display search result on display	XX is searched for on Web and search result is displayed on display.
...	...	...	...	...
Time-shift XX	Recorder	Time-shifting	Time-shift XX program	XX program is time-shifted.
...	...	...	...	...
Wash	Washing machine	Washing	Turn on washing machine	Washing is made.
...	...	...	...	...

FIG. 6

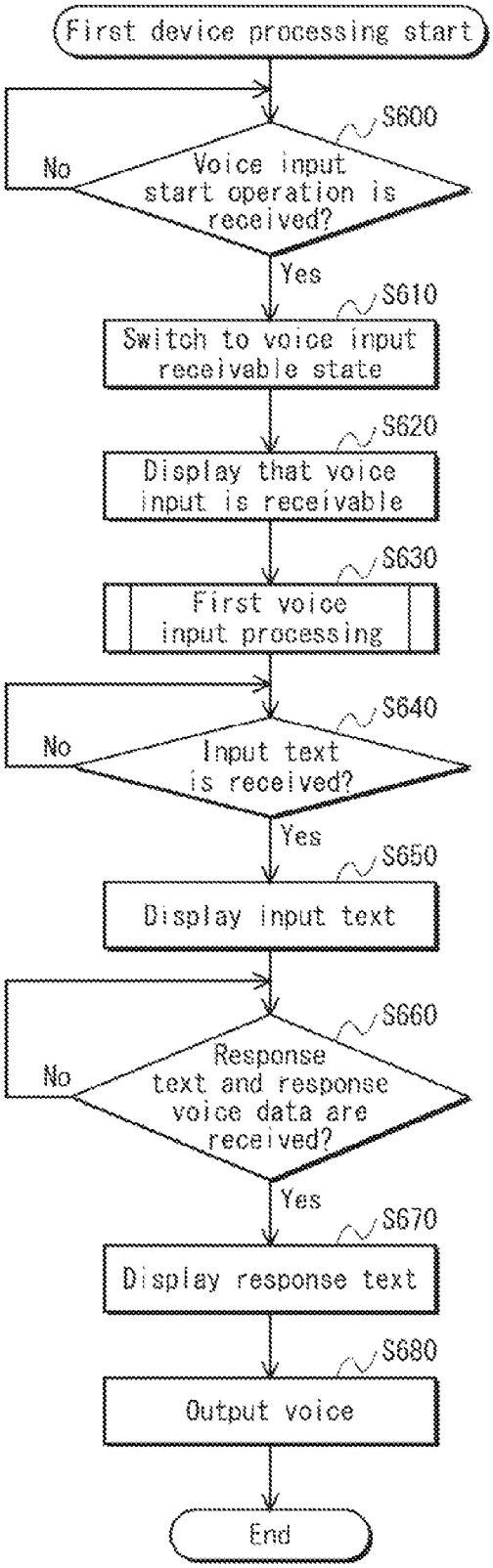

First device processing start
S600
Voice input start operation is received?
No
Yes
S610
Switch to voice input receivable state
S620
Display that voice input is receivable
S630
First voice input processing
S640
Input text is received?
No
Yes
S650
Display input text
S660
Response text and response voice data are received?
No
Yes
S670
Display response text
S680
Output voice
End

FIG. 7

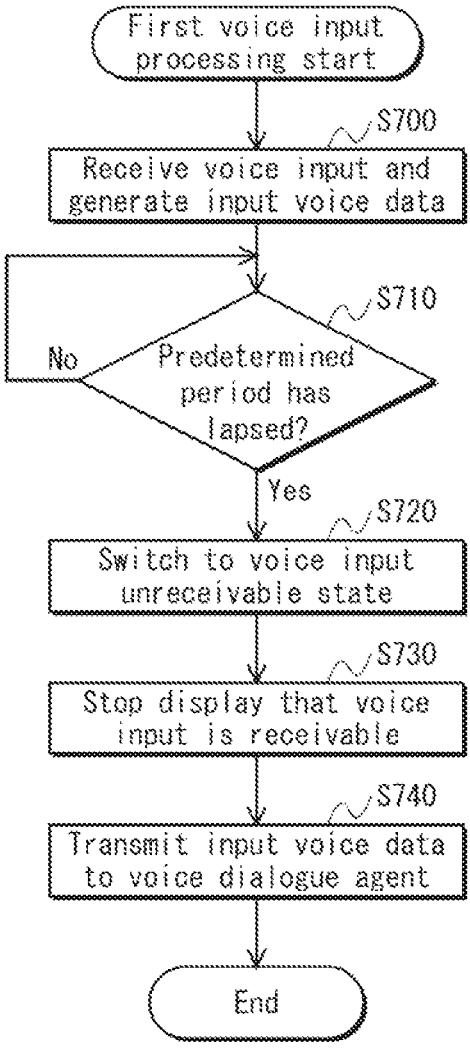

First voice input processing start
S700
Receive voice input and generate input voice data
S710
Predetermined period has lapsed?
No
Yes
S720
Switch to voice input unreceivable state
S730
Stop display that voice input is receivable
S740
Transmit input voice data to voice dialogue agent
End

FIG. 8

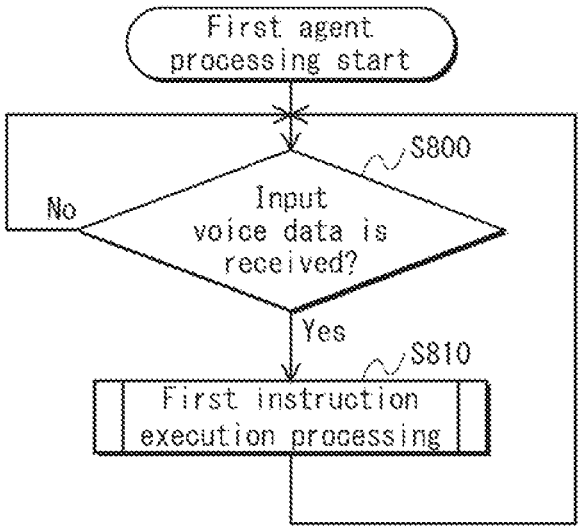

First agent processing start
S800
Input voice data is received?
No
Yes
S810
First instruction execution processing

FIG. 9

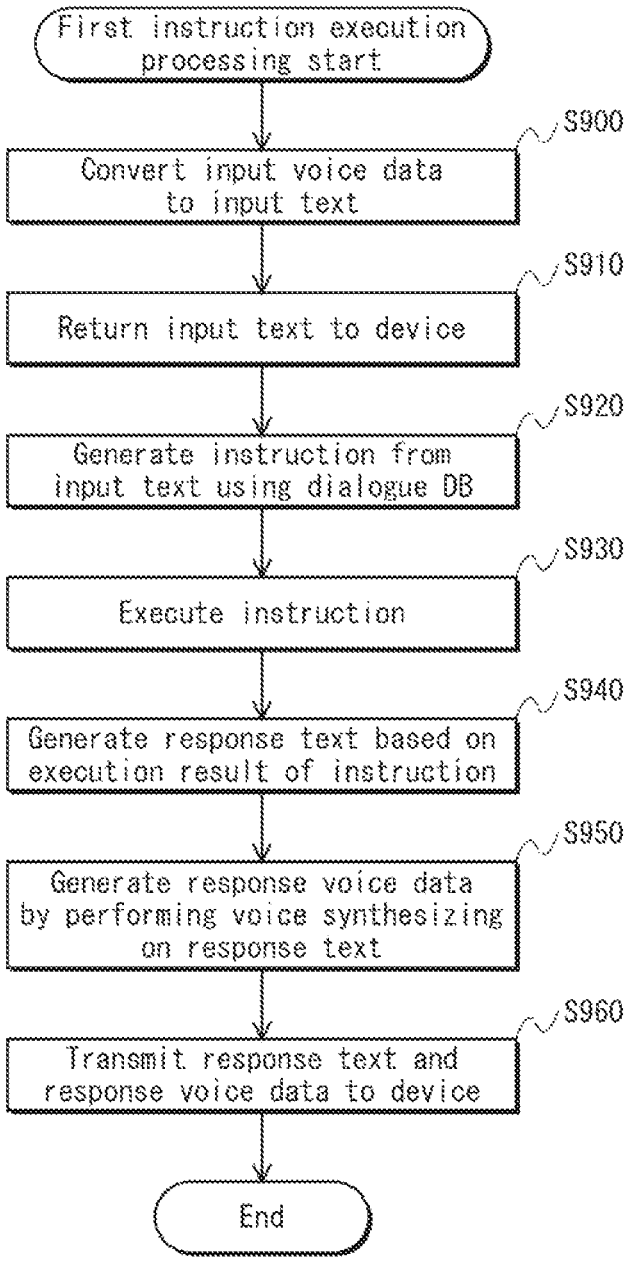

First instruction execution processing start
S900
Convert input voice data to input text
S910
Return input text to device
S920
Generate instruction from input text using dialogue DB
S930
Execute instruction
S940
Generate response text based on execution result of instruction
S950
Generate response voice data by performing voice synthesizing on response text
S960
Transmit response text and response voice data to device
End

FIG. 10

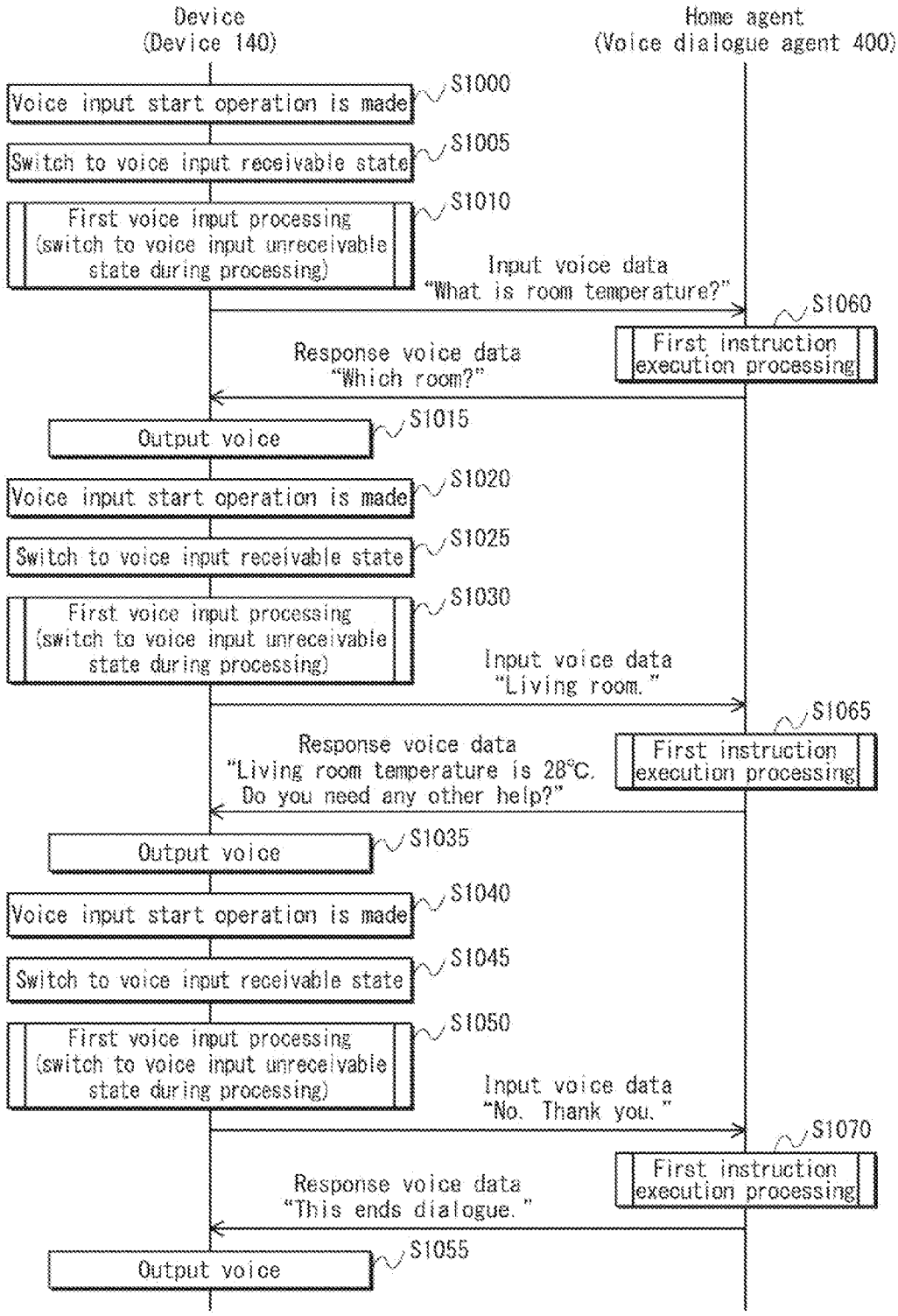

Device
(Device 140)
Home agent
(Voice dialogue agent 400)
Voice input start operation is made
S1000
Switch to voice input receivable state
S1005
First voice input processing
(switch to voice input unreceivable state during processing)
S1010
Input voice data
"What is room temperature?"
S1060
First instruction execution processing
Response voice data
"Which room?"
Output voice
S1015
Voice input start operation is made
S1020
Switch to voice input receivable state
S1025
First voice input processing
(switch to voice input unreceivable state during processing)
S1030
Input voice data
"Living room."
S1065
First instruction execution processing
Response voice data
"Living room temperature is 28℃.
Do you need any other help?"
Output voice
S1035
Voice input start operation is made
S1040
Switch to voice input receivable state
S1045
First voice input processing
(switch to voice input unreceivable state during processing)
S1050
Input voice data
"No. Thank you."
S1070
First instruction execution processing
Response voice data
"This ends dialogue."
Output voice
S1055

FIG. 11A

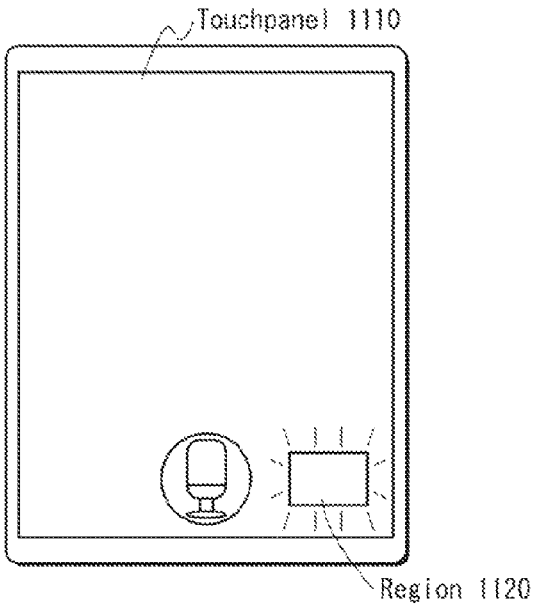


FIG. 11B

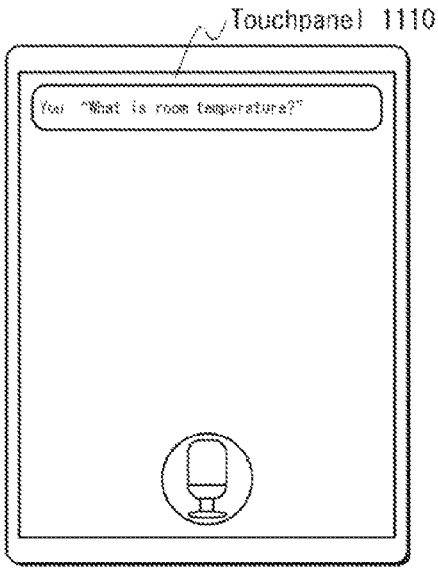


FIG. 11C

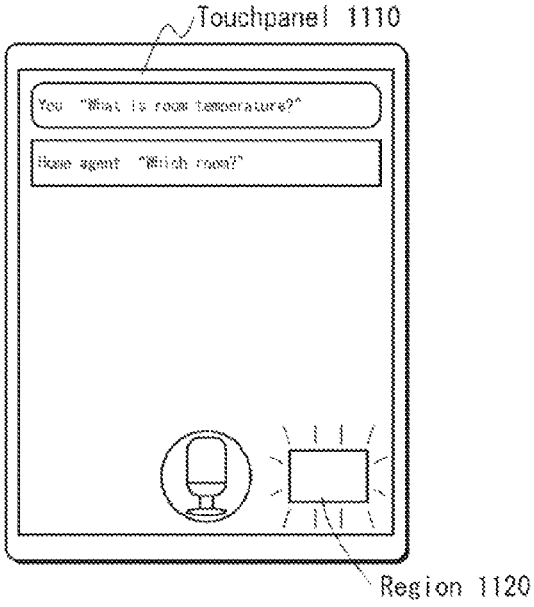


FIG. 11D

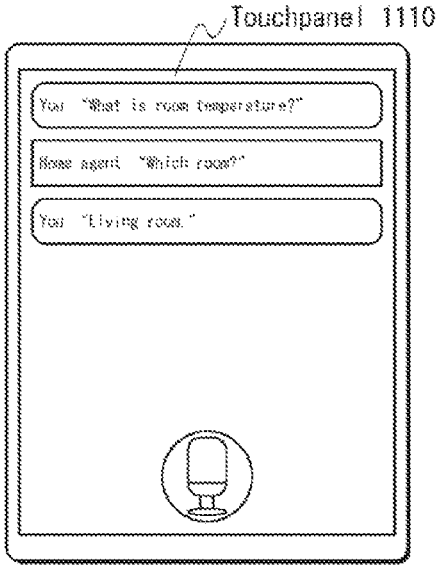


FIG. 12

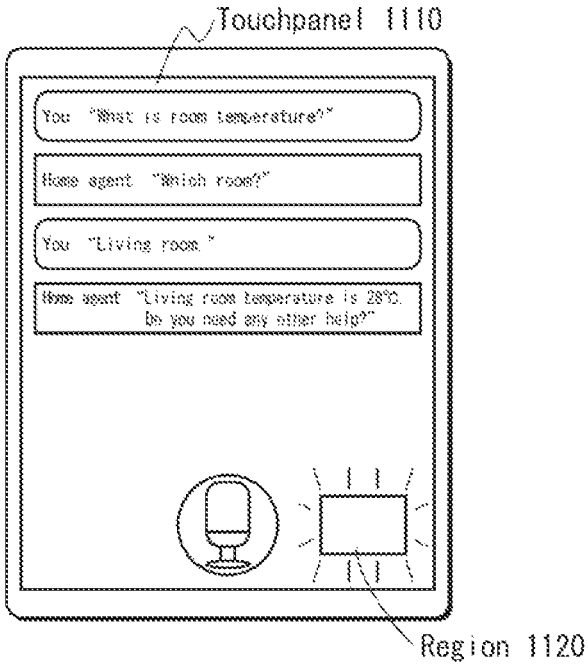

Touchpanel 1110
You "What is room temperature?"
Home agent "Which room?"
You "Living room."
Home agent "Living room temperature is 28°C. Do you need any other help?"
Region 1120

FIG. 13

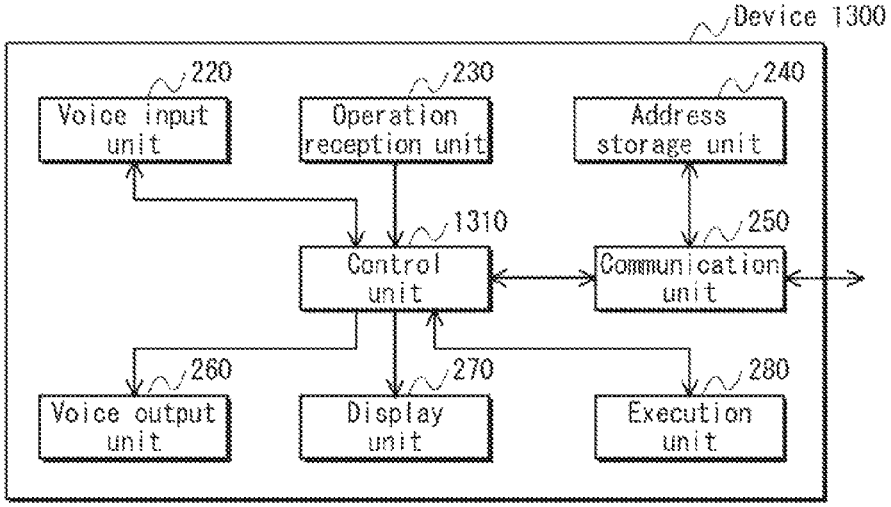

Device 1300
220
Voice input unit
230
Operation reception unit
240
Address storage unit
1310
Control unit
250
Communication unit
260
Voice output unit
270
Display unit
280
Execution unit

FIG. 14

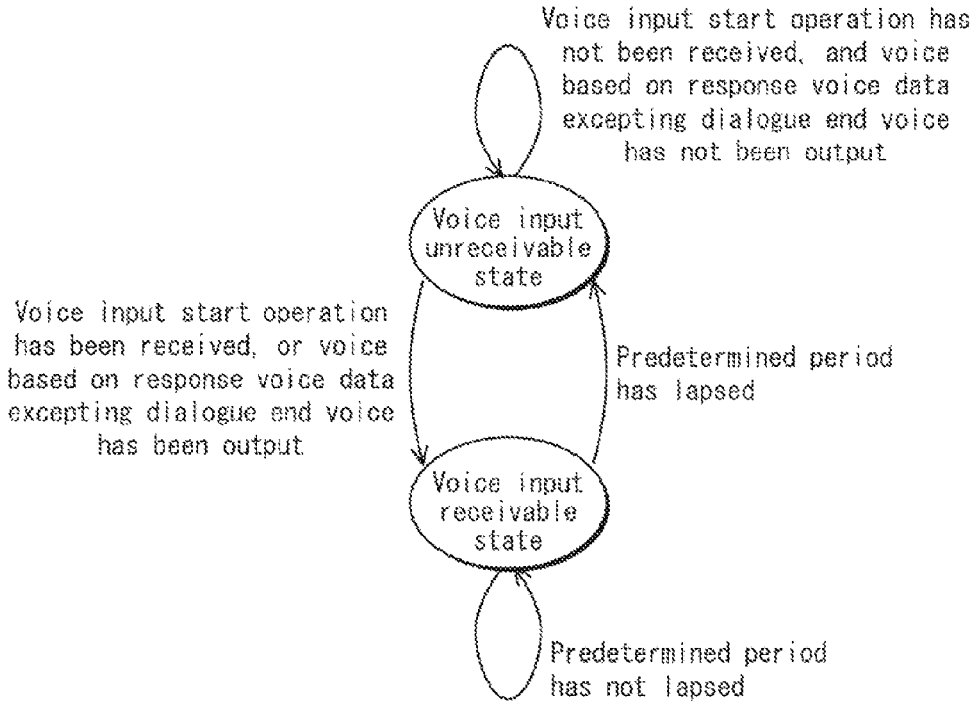

Voice input start operation has not been received, and voice based on response voice data excepting dialogue end voice has not been output
Voice input unreceivable state
Voice input start operation has been received, or voice based on response voice data excepting dialogue end voice has been output
Predetermined period has lapsed
Voice input receivable state
Predetermined period has not lapsed

FIG. 15

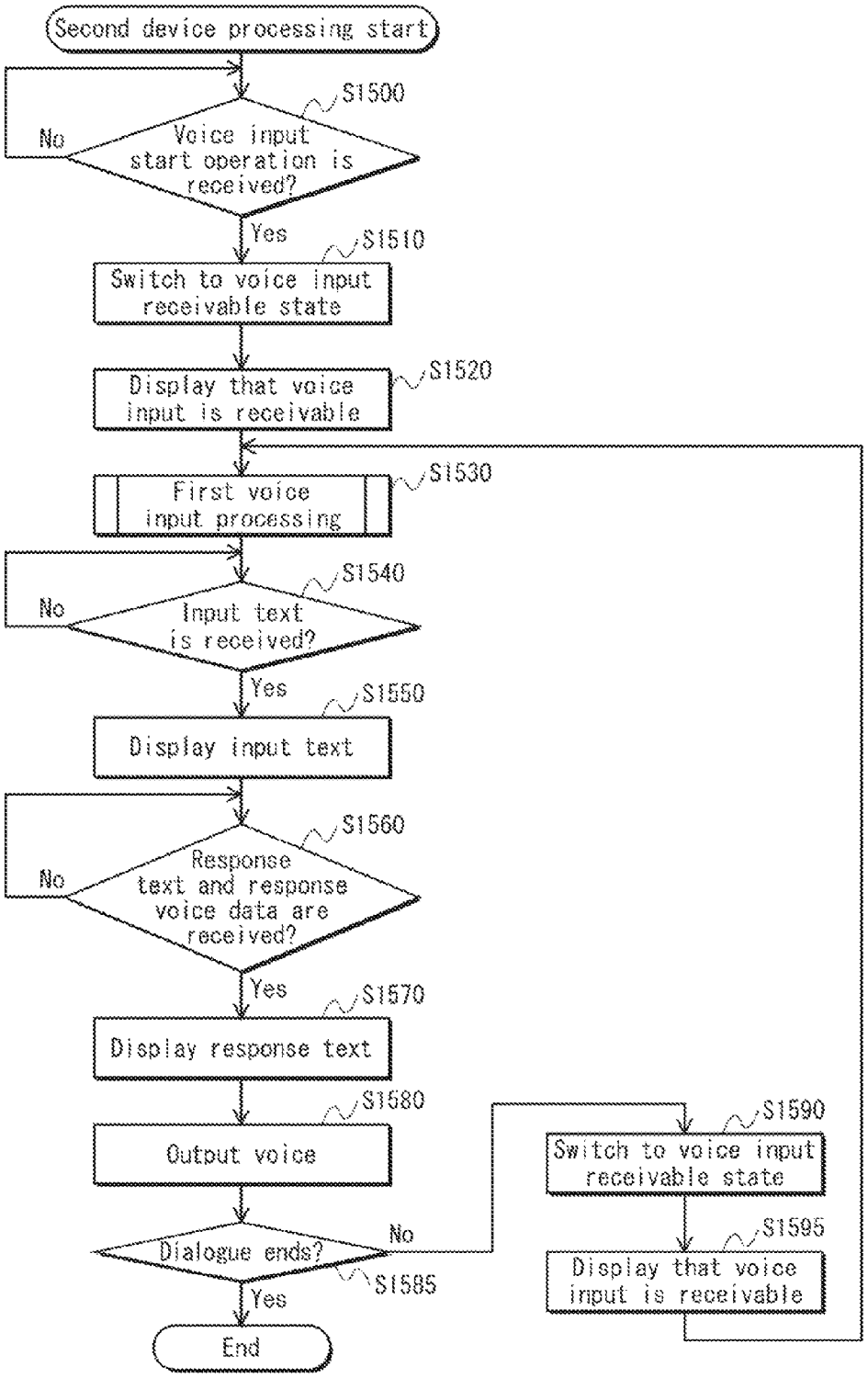

Second device processing start
S1500
Voice input start operation is received?
No
Yes
S1510
Switch to voice input receivable state
S1520
Display that voice input is receivable
S1530
First voice input processing
S1540
Input text is received?
No
Yes
S1550
Display input text
S1560
Response text and response voice data are received?
No
Yes
S1570
Display response text
S1580
Output voice
S1585
Dialogue ends?
No
Yes
End
S1590
Switch to voice input receivable state
S1595
Display that voice input is receivable

FIG. 16

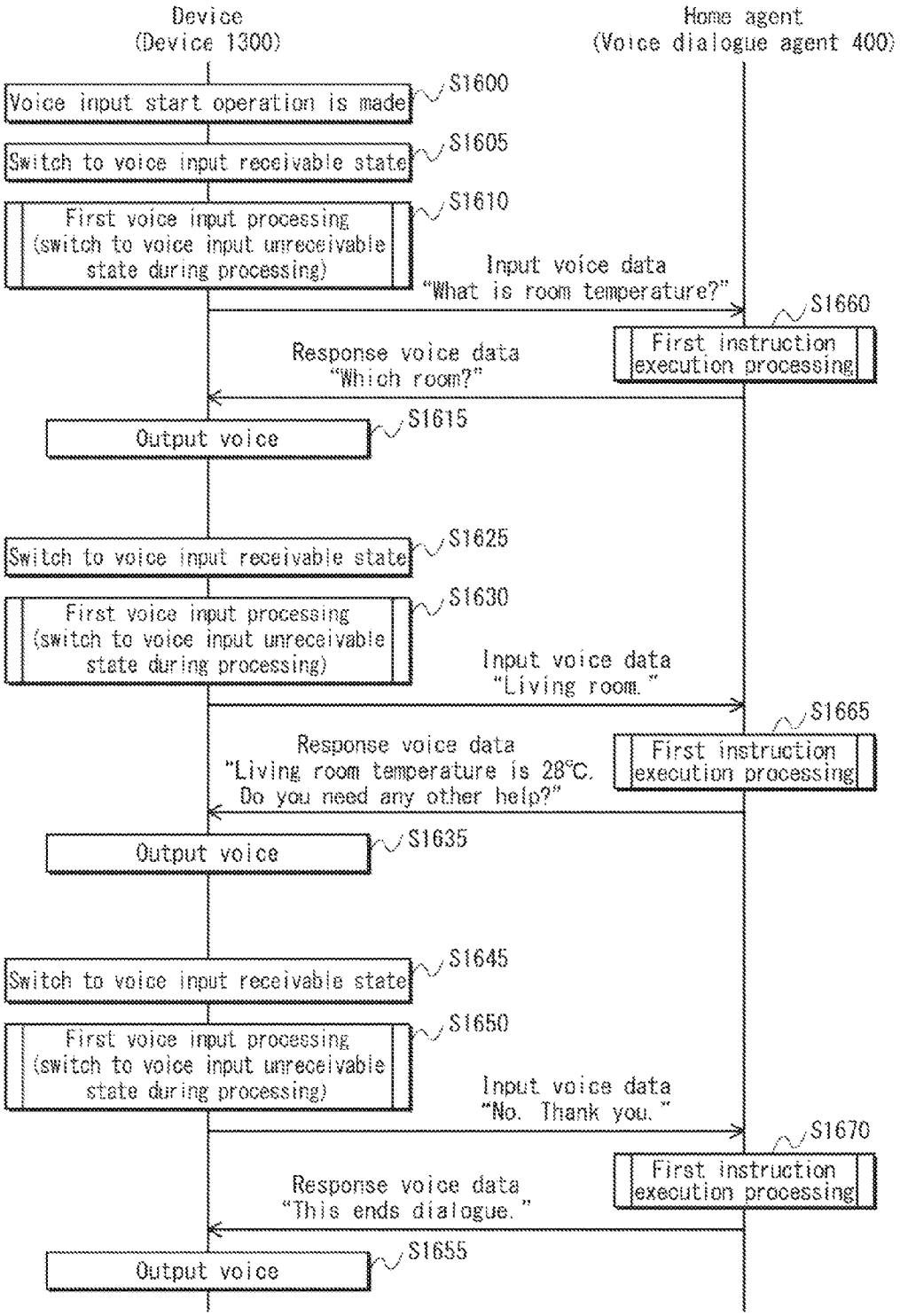

Device
(Device 1300)
Home agent
(Voice dialogue agent 400)
Voice input start operation is made
S1600
Switch to voice input receivable state
S1605
First voice input processing
(switch to voice input unreceivable state during processing)
S1610
Input voice data
"What is room temperature?"
S1660
First instruction execution processing
Response voice data
"Which room?"
Output voice
S1615
Switch to voice input receivable state
S1625
First voice input processing
(switch to voice input unreceivable state during processing)
S1630
Input voice data
"Living room."
S1665
First instruction execution processing
Response voice data
"Living room temperature is 28℃.
Do you need any other help?"
Output voice
S1635
Switch to voice input receivable state
S1645
First voice input processing
(switch to voice input unreceivable state during processing)
S1650
Input voice data
"No. Thank you."
S1670
First instruction execution processing
Response voice data
"This ends dialogue."
Output voice
S1655

FIG. 17

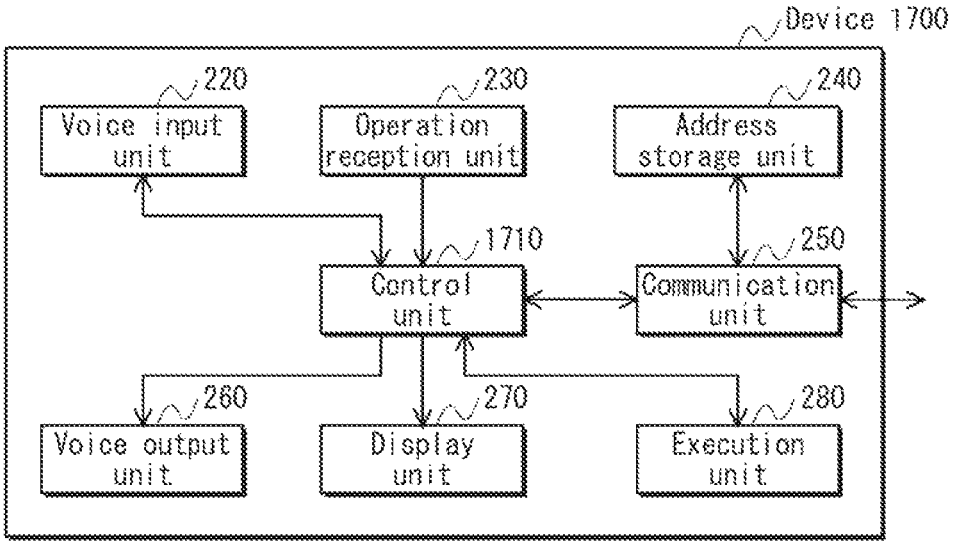

Device 1700
220
Voice input unit
230
Operation reception unit
240
Address storage unit
1710
Control unit
250
Communication unit
260
Voice output unit
270
Display unit
280
Execution unit

FIG. 18

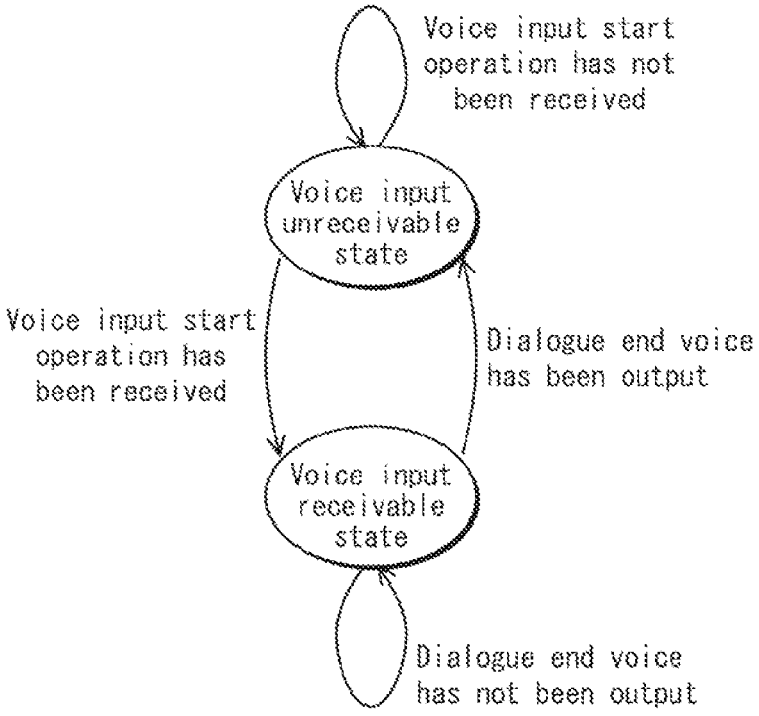

Voice input start operation has not been received
Voice input unreceivable state
Voice input start operation has been received
Dialogue end voice has been output
Voice input receivable state
Dialogue end voice has not been output

FIG. 19

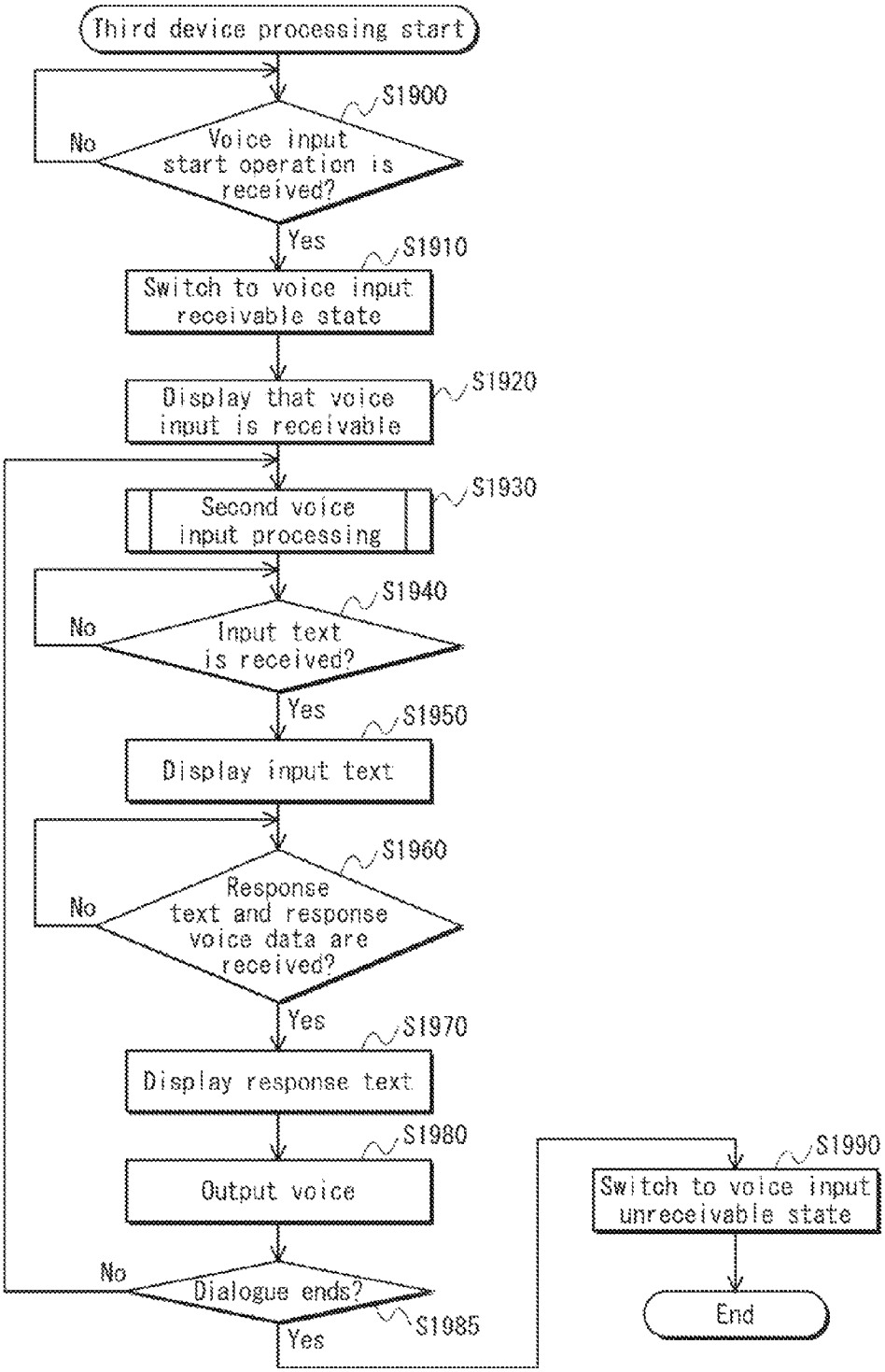

Third device processing start
S1900
Voice input start operation is received?
No
Yes
S1910
Switch to voice input receivable state
S1920
Display that voice input is receivable
S1930
Second voice input processing
S1940
Input text is received?
No
Yes
S1950
Display input text
S1960
Response text and response voice data are received?
No
Yes
S1970
Display response text
S1980
Output voice
Dialogue ends?
No
Yes
S1985
S1990
Switch to voice input unreceivable state
End

FIG. 20

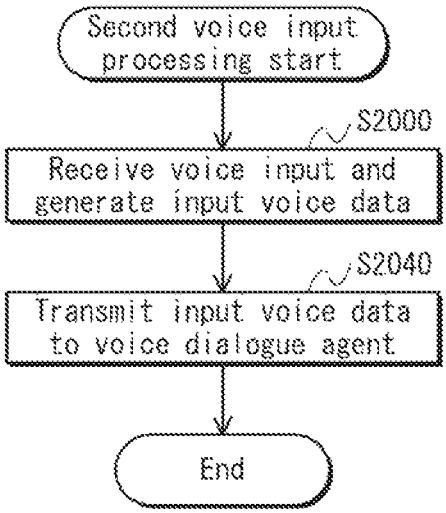

Second voice input processing start
S2000
Receive voice input and generate input voice data
S2040
Transmit input voice data to voice dialogue agent
End

FIG. 21

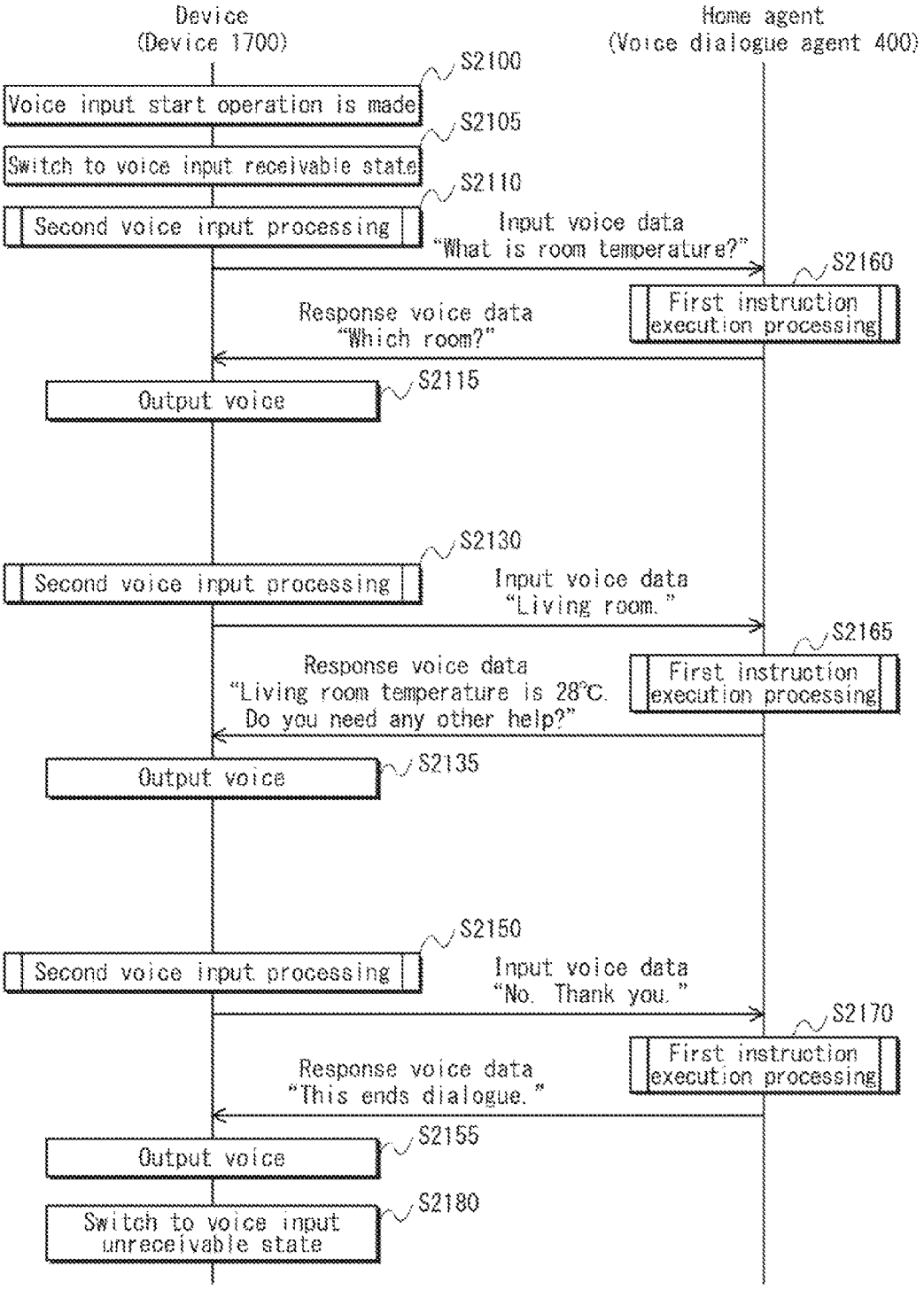

Device
(Device 1700)
Home agent
(Voice dialogue agent 400)
S2100
Voice input start operation is made
S2105
Switch to voice input receivable state
S2110
Second voice input processing
Input voice data
"What is room temperature?"
S2160
First instruction execution processing
Response voice data
"Which room?"
Output voice
S2115
S2130
Second voice input processing
Input voice data
"Living room."
S2165
First instruction execution processing
Response voice data
"Living room temperature is 28℃.
Do you need any other help?"
Output voice
S2135
S2150
Second voice input processing
Input voice data
"No. Thank you."
S2170
First instruction execution processing
Response voice data
"This ends dialogue."
Output voice
S2155
Switch to voice input unreceivable state
S2180

FIG. 22

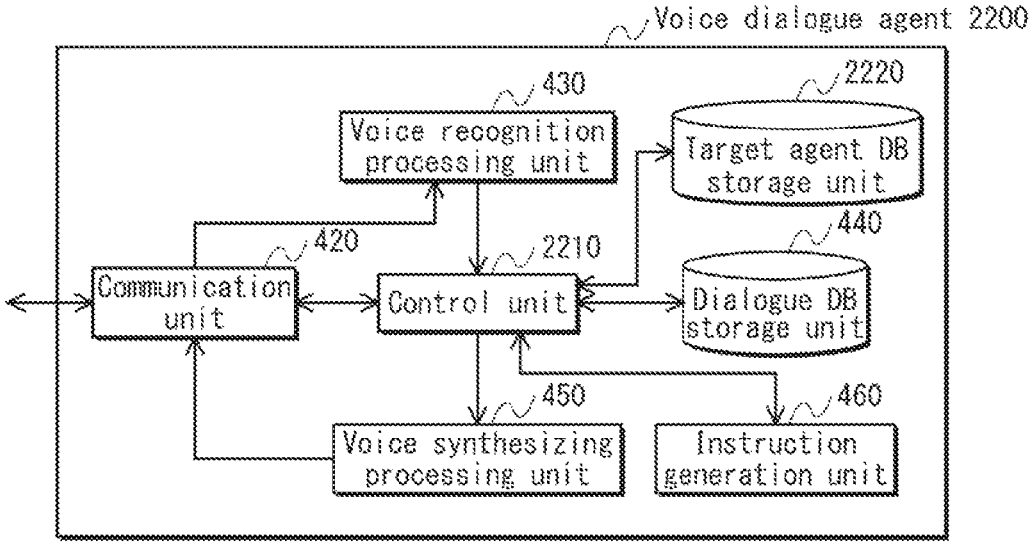

Voice dialogue agent 2200
430
Voice recognition processing unit
2220
Target agent DB storage unit
420
2210
440
Communication unit
Control unit
Dialogue DB storage unit
450
460
Voice synthesizing processing unit
Instruction generation unit

FIG. 23

Target agent DB 2300

2310 Keyword	2320 Target agent	2330 IP address
In-car	Car agent	132.182.xxx.48:443
Car	Car agent	132.182.xxx.48:443
Vehicle	Car agent	132.182.xxx.48:443
Navigation system	Car agent	132.182.xxx.48:443
Convenience store	Retailer agent	156.222.yyy.1:442
...	...	...
Living room	Home agent	142.162.zzz.3:2000
Entrance	Home agent	142.162.zzz.3:2000
Toilet	Home agent	142.162.zzz.3:2000
...	...	...

FIG. 24

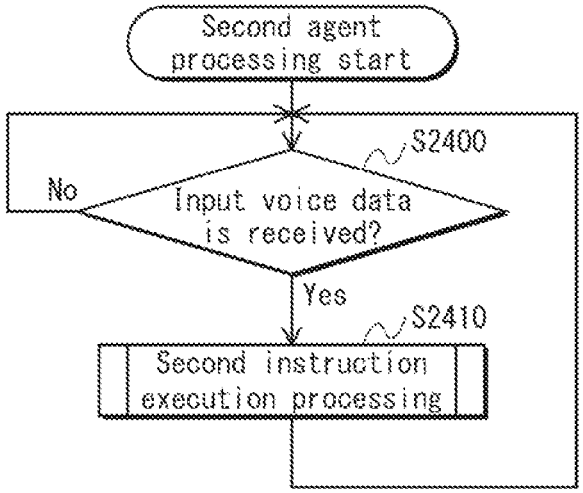


FIG. 25

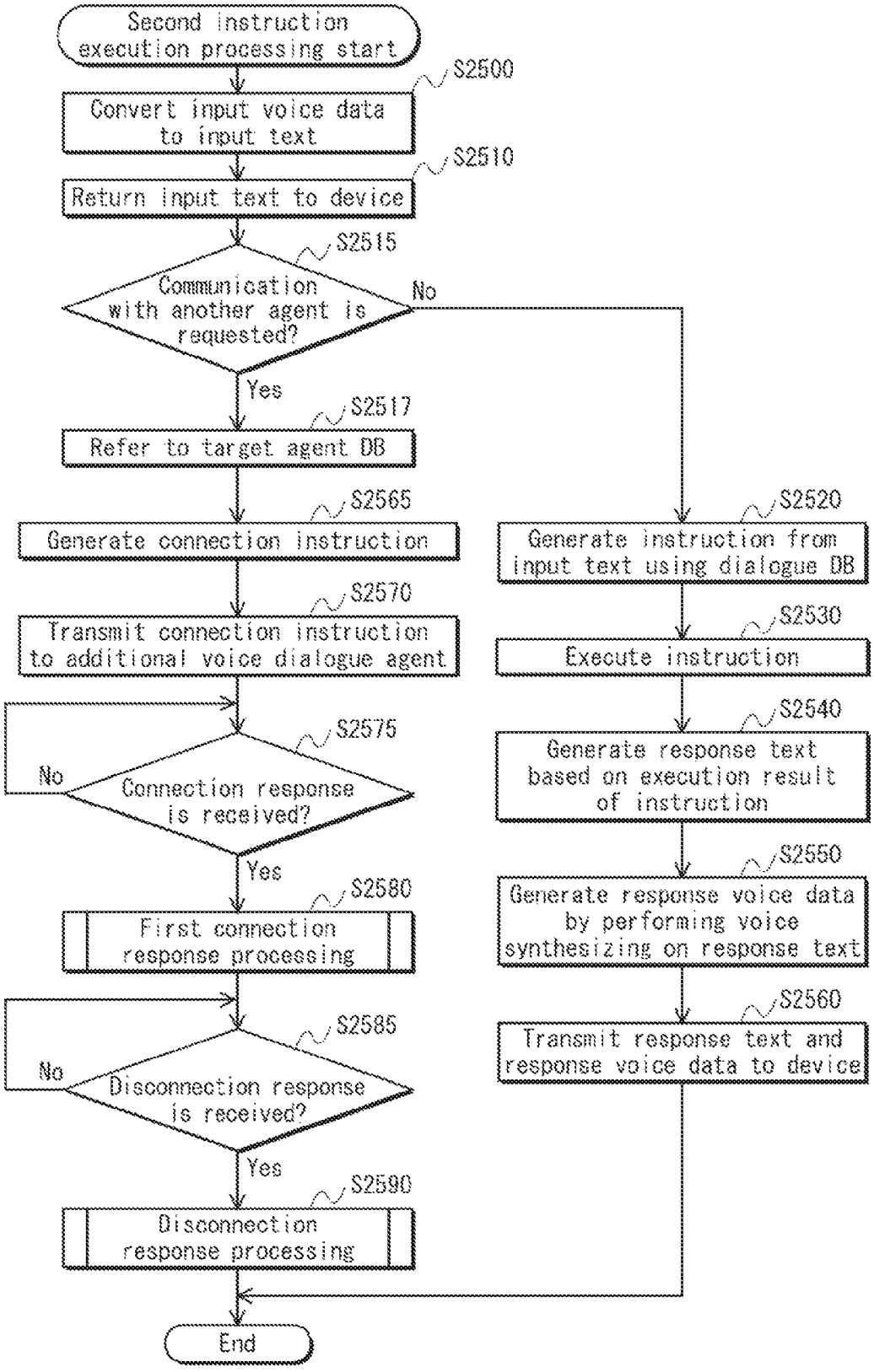

Second instruction execution processing start
S2500
Convert input voice data to input text
S2510
Return input text to device
S2515
Communication with another agent is requested?
No
Yes
S2517
Refer to target agent DB
S2565
Generate connection instruction
S2570
Transmit connection instruction to additional voice dialogue agent
S2575
No
Connection response is received?
Yes
S2580
First connection response processing
S2585
No
Disconnection response is received?
Yes
S2590
Disconnection response processing
End
S2520
Generate instruction from input text using dialogue DB
S2530
Execute instruction
S2540
Generate response text based on execution result of instruction
S2550
Generate response voice data by performing voice synthesizing on response text
S2560
Transmit response text and response voice data to device

FIG. 26

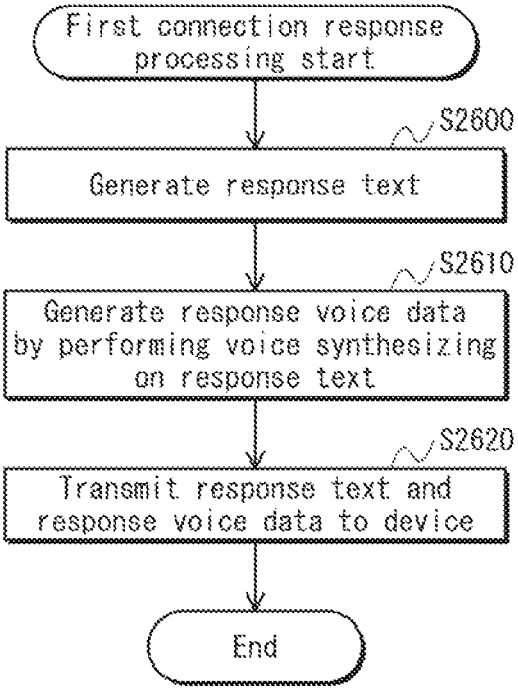

First connection response processing start
S2600
Generate response text
S2610
Generate response voice data by performing voice synthesizing on response text
S2620
Transmit response text and response voice data to device
End

FIG. 27

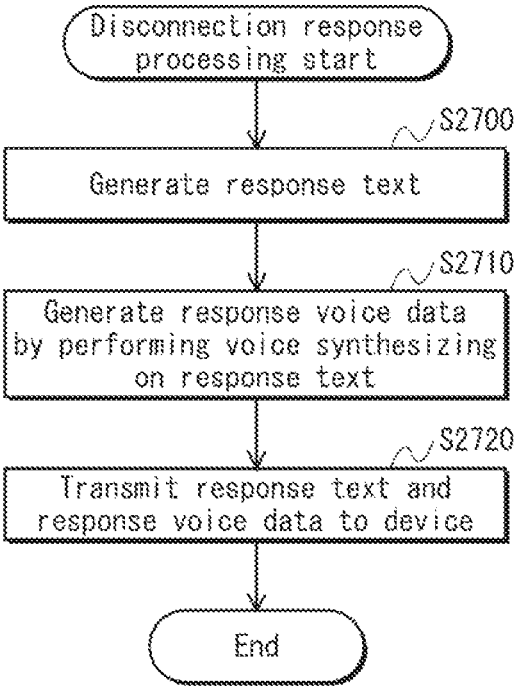

Disconnection response processing start
S2700
Generate response text
S2710
Generate response voice data by performing voice synthesizing on response text
S2720
Transmit response text and response voice data to device
End

FIG. 28

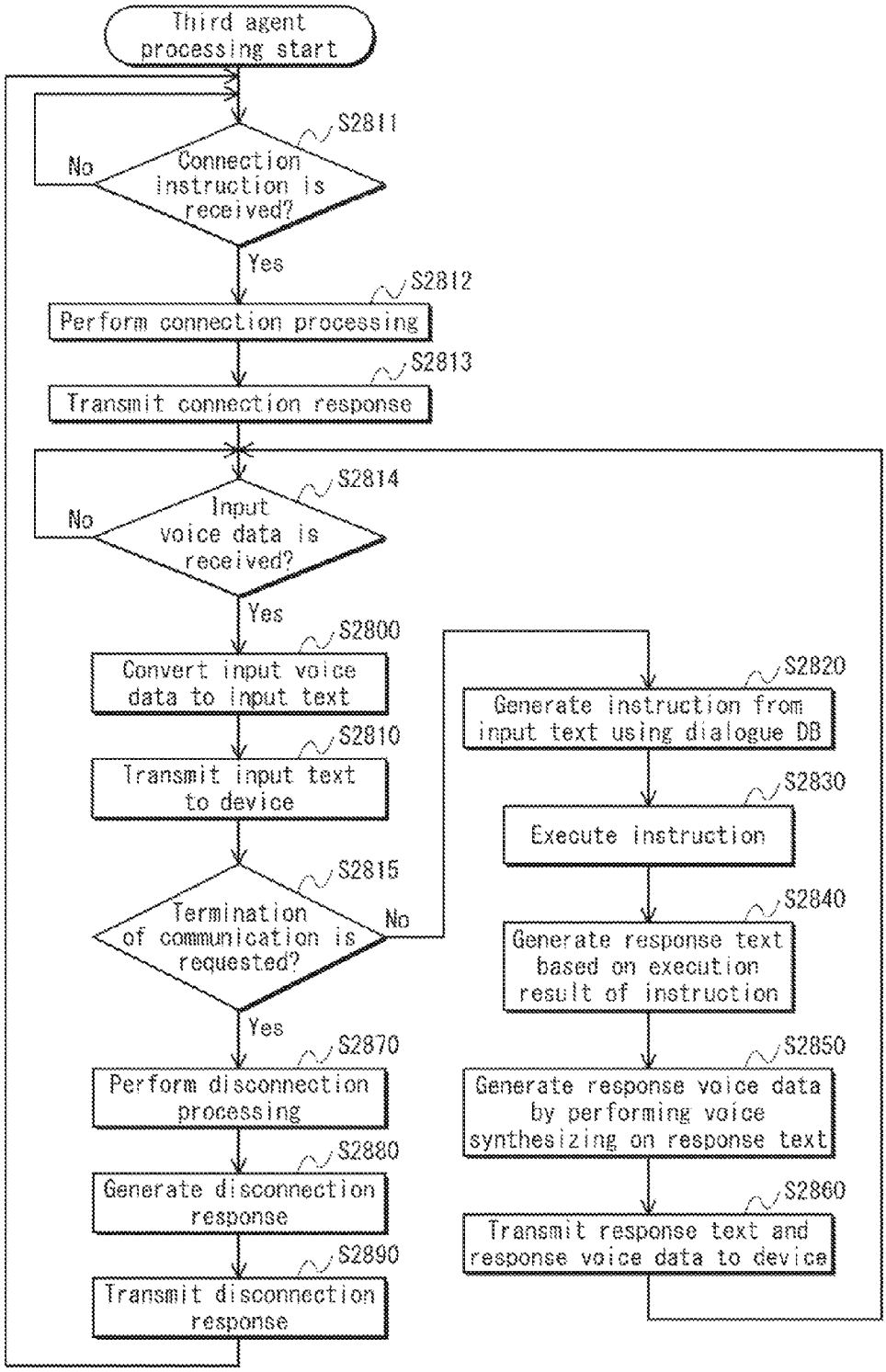

Third agent processing start
S2811
Connection instruction is received?
No
Yes
S2812
Perform connection processing
S2813
Transmit connection response
S2814
Input voice data is received?
No
Yes
S2800
Convert input voice data to input text
S2810
Transmit input text to device
S2815
Termination of communication is requested?
No
Yes
S2870
Perform disconnection processing
S2880
Generate disconnection response
S2890
Transmit disconnection response
S2820
Generate instruction from input text using dialogue DB
S2830
Execute instruction
S2840
Generate response text based on execution result of instruction
S2850
Generate response voice data by performing voice synthesizing on response text
S2860
Transmit response text and response voice data to device

FIG. 29

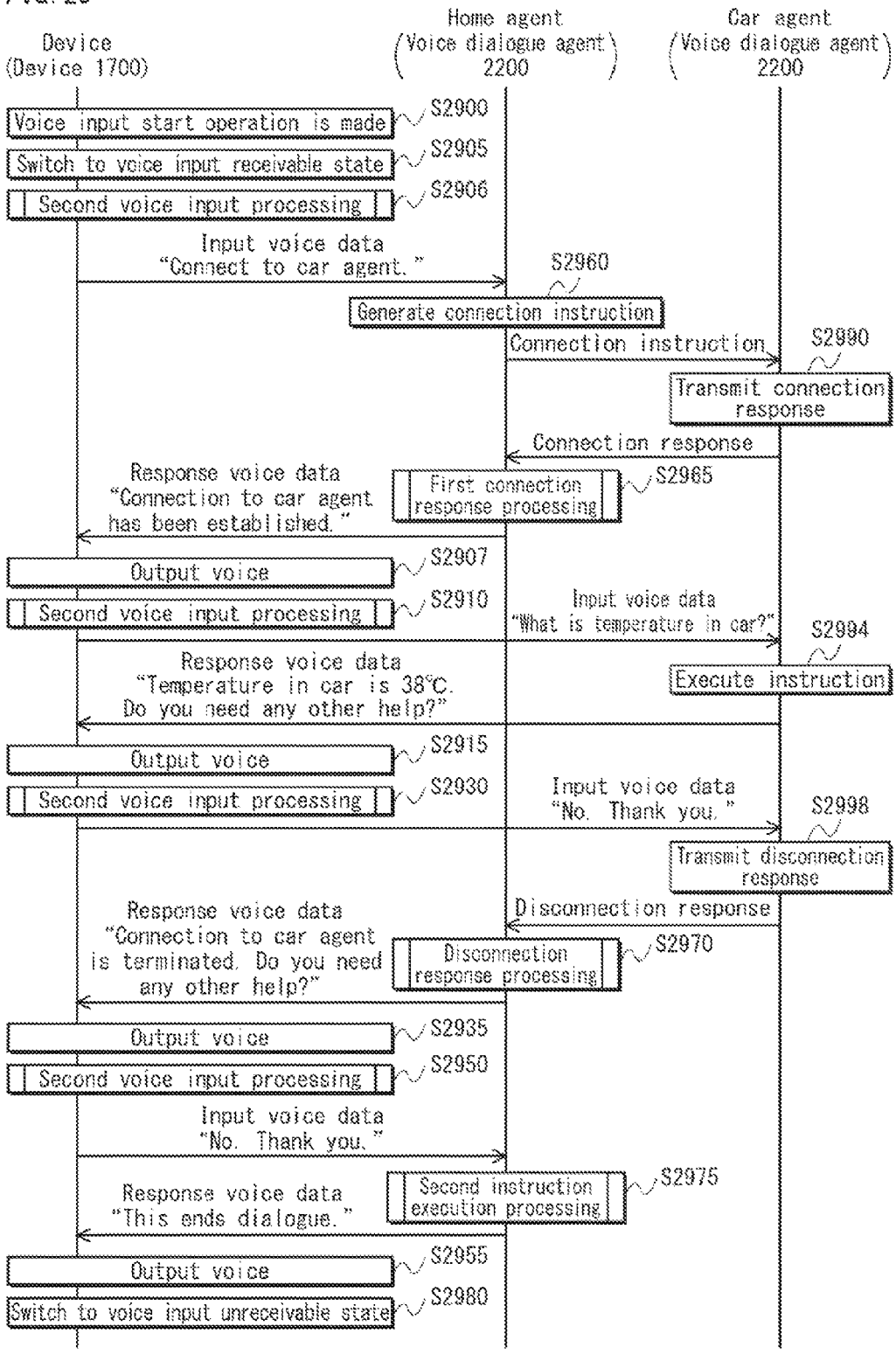

Device
(Device 1700)
Home agent
(Voice dialogue agent
2200)
Car agent
(Voice dialogue agent
2200)
Voice input start operation is made
S2900
Switch to voice input receivable state
S2905
Second voice input processing
S2906
Input voice data
"Connect to car agent."
S2960
Generate connection instruction
Connection instruction
S2980
Transmit connection response
Connection response
Response voice data
"Connection to car agent has been established."
First connection response processing
S2965
Output voice
S2907
Second voice input processing
S2910
Input voice data
"What is temperature in car?"
S2984
Execute instruction
Response voice data
"Temperature in car is 38℃. Do you need any other help?"
Output voice
S2915
Second voice input processing
S2930
Input voice data
"No. Thank you."
S2998
Transmit disconnection response
Disconnection response
Response voice data
"Connection to car agent is terminated. Do you need any other help?"
Disconnection response processing
S2970
Output voice
S2935
Second voice input processing
S2950
Input voice data
"No. Thank you."
Second instruction execution processing
S2975
Response voice data
"This ends dialogue."
Output voice
S2955
Switch to voice input unreceivable state
S2980

FIG. 30

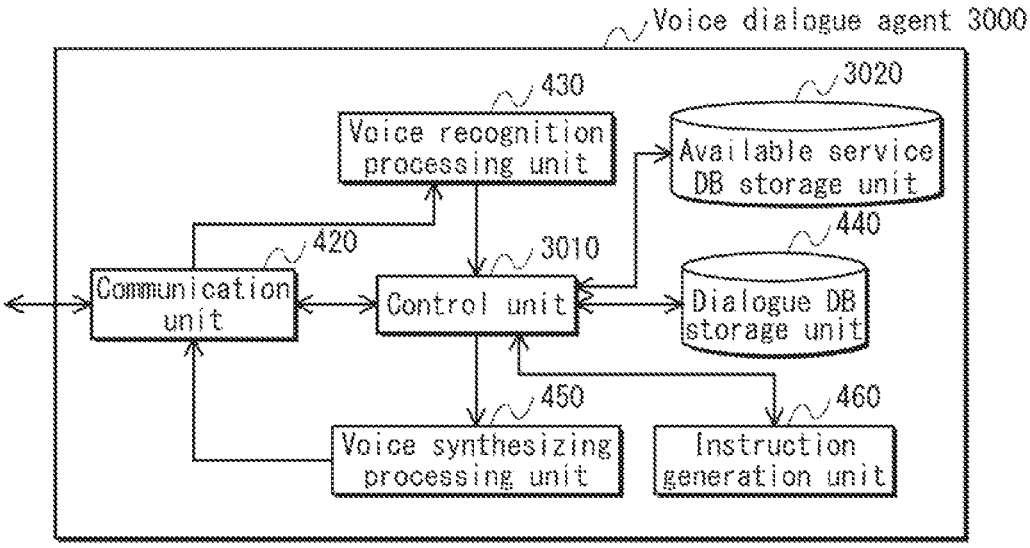

Voice dialogue agent 3000
430
Voice recognition processing unit
3020
Available service DB storage unit
420
3010
440
Communication unit
Control unit
Dialogue DB storage unit
450
460
Voice synthesizing processing unit
Instruction generation unit

FIG. 31

Available service DB 3100

3110 Keyword	3120 Target agent	3130 Processing details	3140 IP address	3150 Availability
Temperature, In-car	Car agent	Acquire and display temperature in car	132.182.xxx.48:443	Available
Temperature, Living room	Home agent	Acquire and display temperature in living room	142.162.zzz.3:2000	Unavailable
Unlock, Car	Car agent	Unlock door of car	132.182.xxx.48:443	Available
Unlock, Home	Home agent	Unlock door of home	142.162.zzz.3:2000	Unavailable
Price, Boxed lunch	Retailer agent	Acquire and display price of boxed lunch	156.222.yyy.1:442	Unavailable
...	...	...	...	...
Run hot water, Bath	Home agent	Run hot water in bath in home	142.162.zzz.3:2000	Unavailable
Turn on, Air conditioner, Living room	Home agent	Turn on air conditioner in home	142.162.zzz.3:2000	Unavailable
Turn on, Air conditioner, Car	Car agent	Turn on air conditioner in car	132.182.xxx.48:443	Available
...	...	...	...	...

FIG. 32

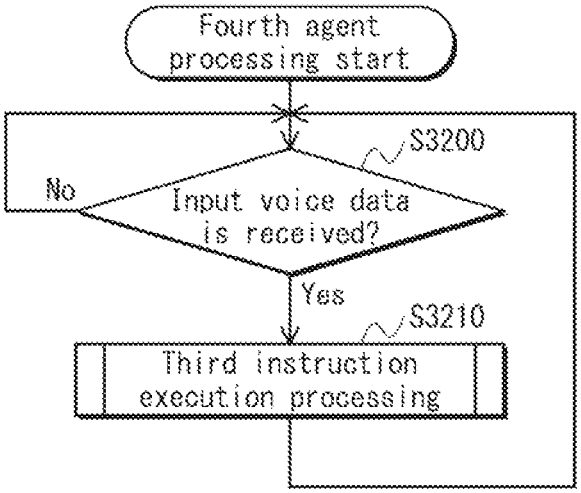

Fourth agent processing start
S3200
No
Input voice data is received?
Yes
S3210
Third instruction execution processing

FIG. 33

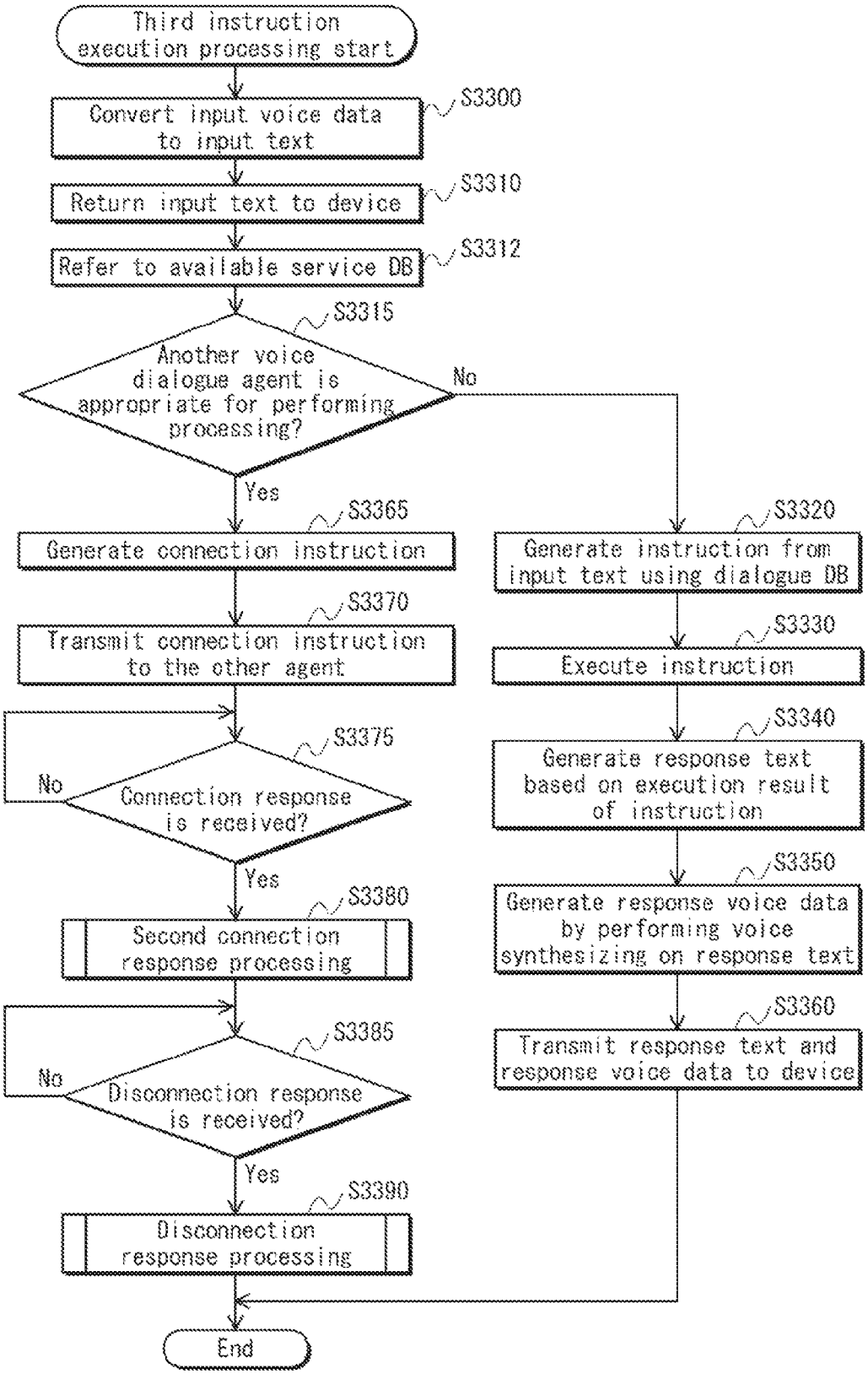

Third instruction execution processing start
Convert input voice data to input text
S3300
Return input text to device
S3310
Refer to available service DB
S3312
S3315
Another voice dialogue agent is appropriate for performing processing?
No
Yes
S3365
Generate connection instruction
S3370
Transmit connection instruction to the other agent
S3375
No
Connection response is received?
Yes
S3380
Second connection response processing
S3385
No
Disconnection response is received?
Yes
S3390
Disconnection response processing
End
S3320
Generate instruction from input text using dialogue DB
S3330
Execute instruction
S3340
Generate response text based on execution result of instruction
S3350
Generate response voice data by performing voice synthesizing on response text
S3360
Transmit response text and response voice data to device

FIG. 34

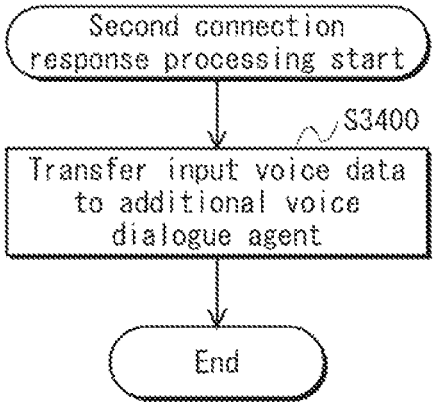
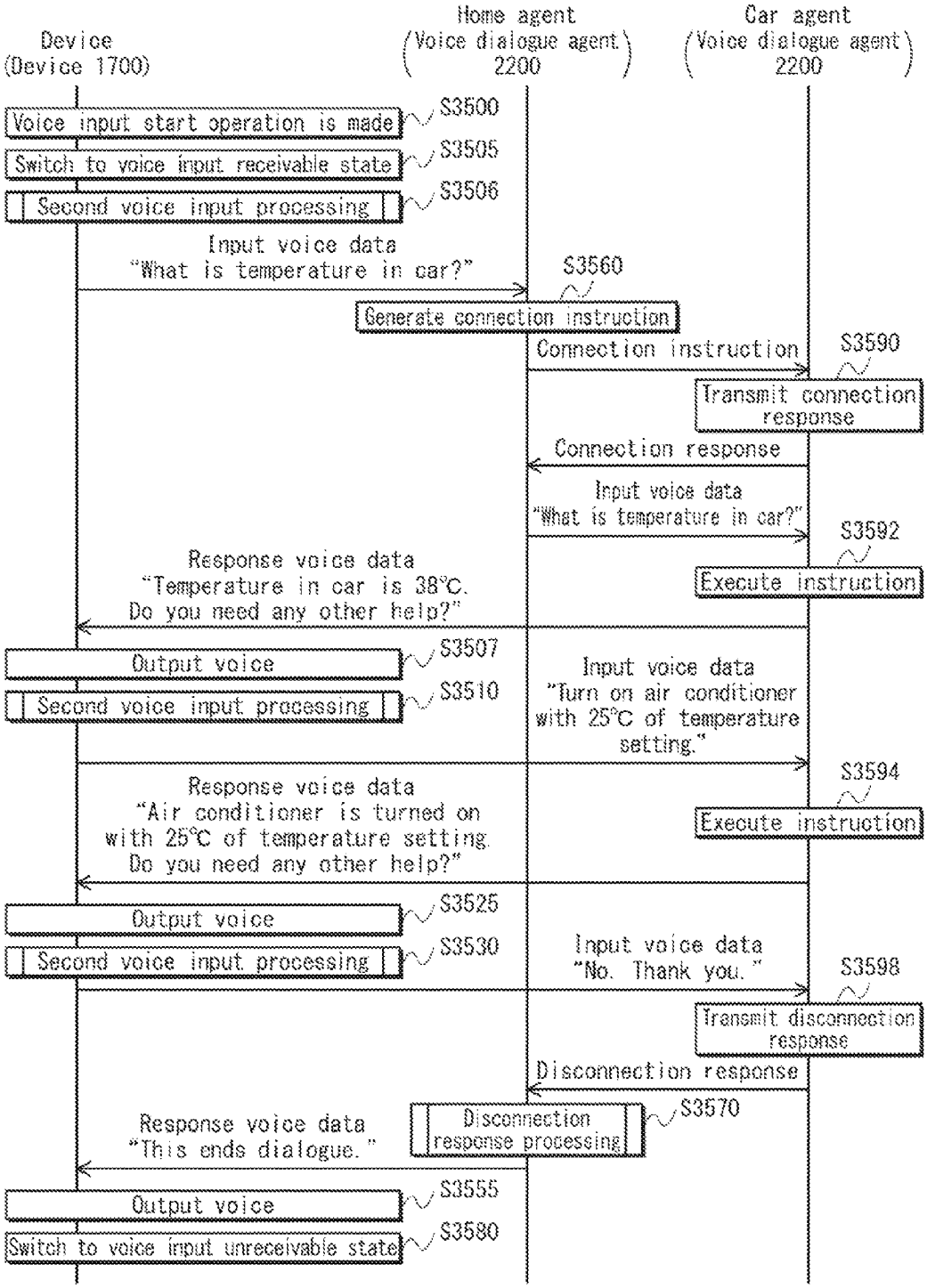

Second connection response processing start
S3400
Transfer input voice data to additional voice dialogue agent
End

FIG. 35


Device
(Device 1700)
Home agent
(Voice dialogue agent
2200)
Car agent
(Voice dialogue agent
2200)
Voice input start operation is made
S3500
Switch to voice input receivable state
S3505
Second voice input processing
S3506
Input voice data
"What is temperature in car?"
S3560
Generate connection instruction
Connection instruction
S3590
Transmit connection response
Connection response
Input voice data
"What is temperature in car?"
S3592
Execute instruction
Response voice data
"Temperature in car is 38℃.
Do you need any other help?"
Output voice
S3507
Second voice input processing
S3510
Input voice data
"Turn on air conditioner with 25℃ of temperature setting."
S3594
Execute instruction
Response voice data
"Air conditioner is turned on with 25℃ of temperature setting.
Do you need any other help?"
Output voice
S3525
Second voice input processing
S3530
Input voice data
"No. Thank you."
S3598
Transmit disconnection response
Disconnection response
Disconnection response processing
S3570
Response voice data
"This ends dialogue."
Output voice
S3555
Switch to voice input unreceivable state
S3580

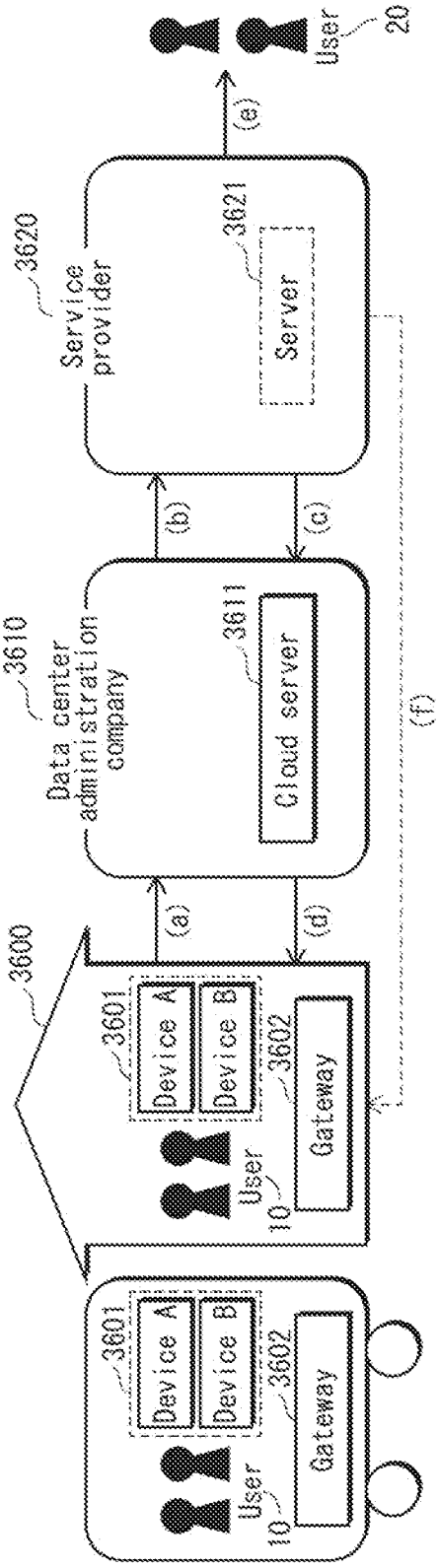


FIG. 36A

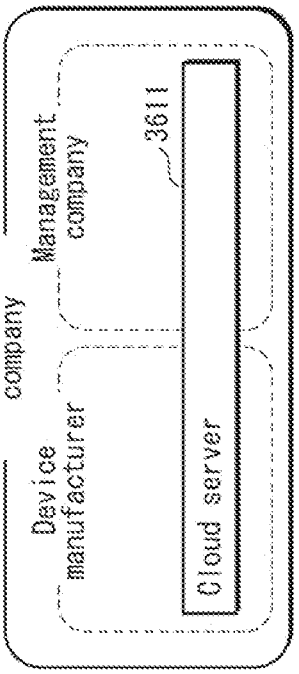


FIG. 36C

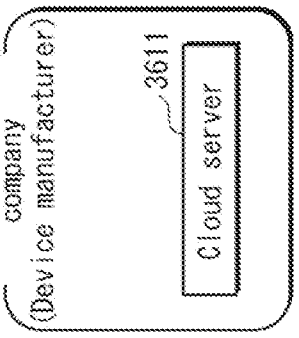


FIG. 36B

FIG. 37

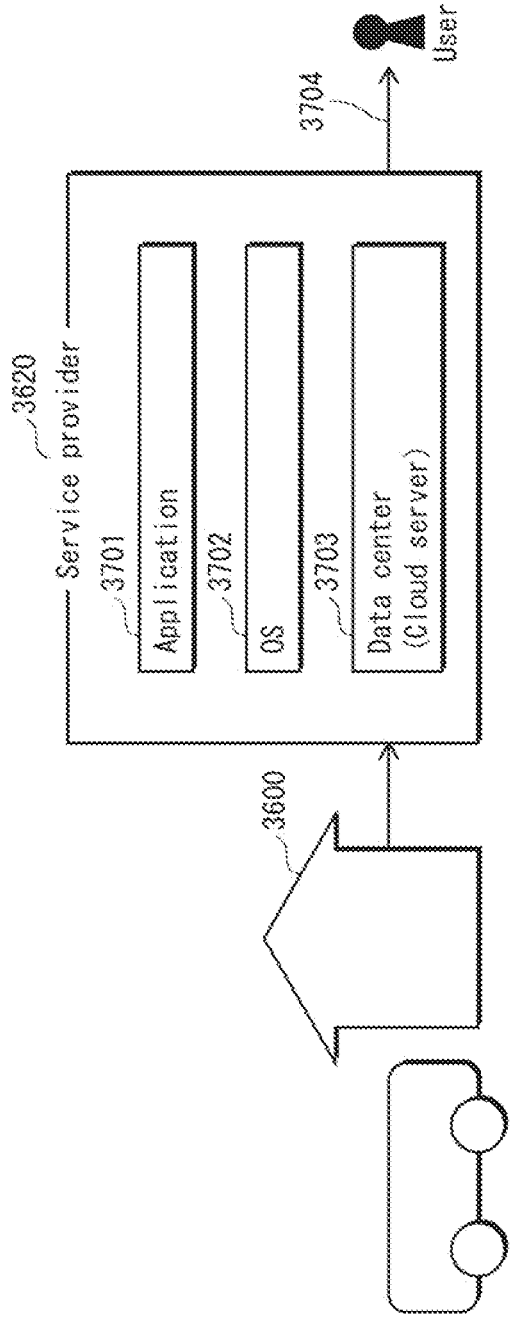

User
3704
3620
Service provider
3701
Application
3702
OS
3703
Data center
(Cloud server)
3600

FIG. 38

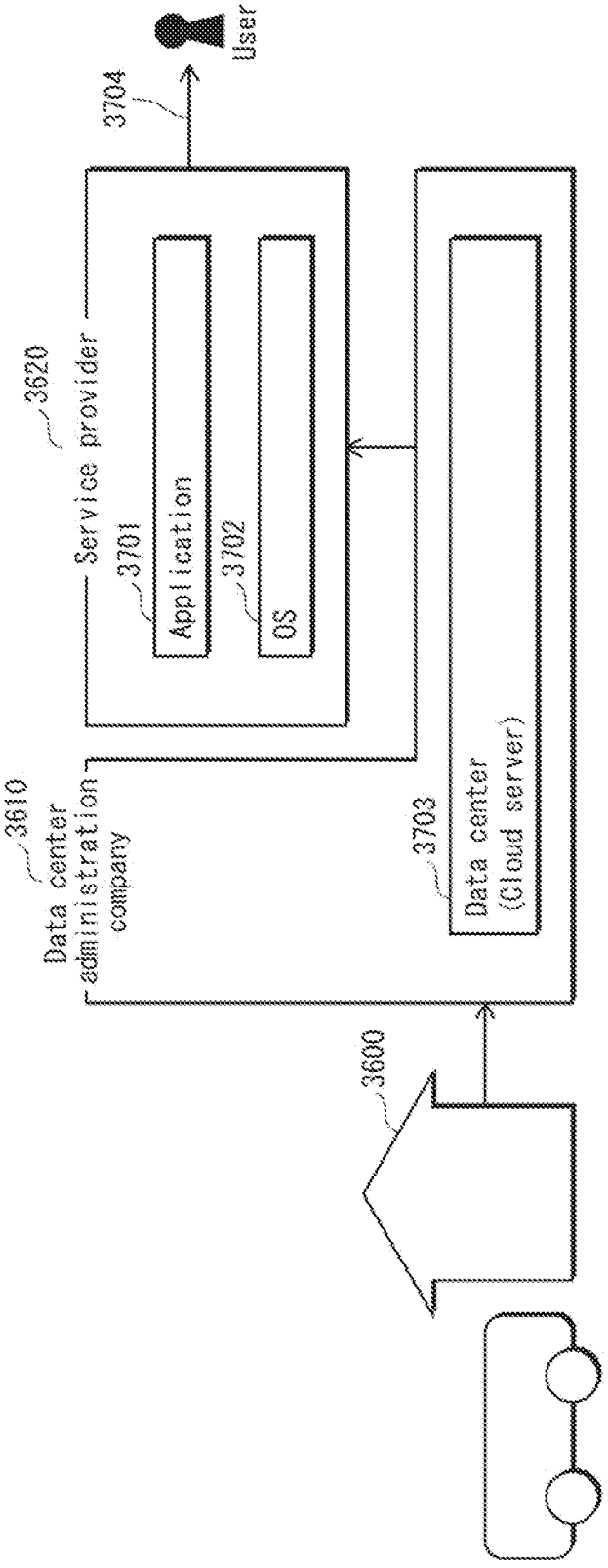

User
3704
3620
Service provider
3701
Application
3702
OS
3610
Data center administration company
3703
Data center (Cloud server)
3600

FIG. 39

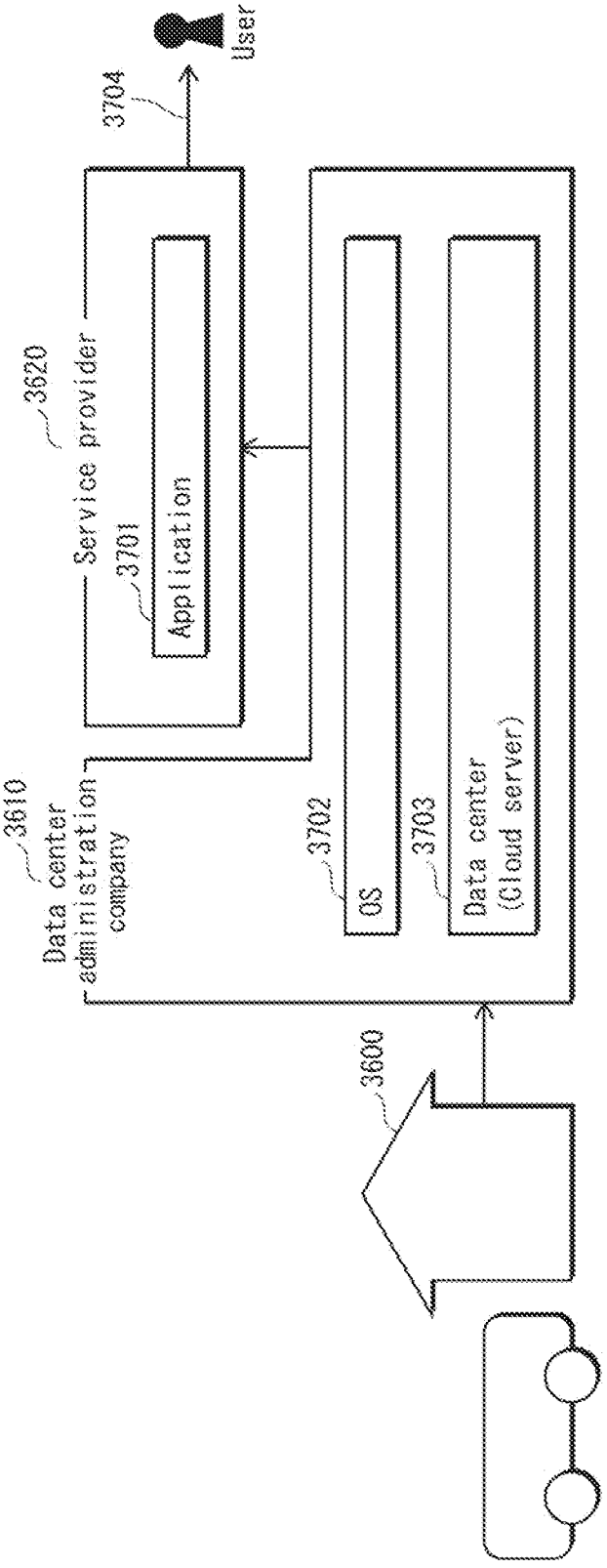

User
3704
3620
Service provider
3701
Application
3610
Data center administration company
3702
OS
3703
Data center (Cloud server)
3600

FIG. 40

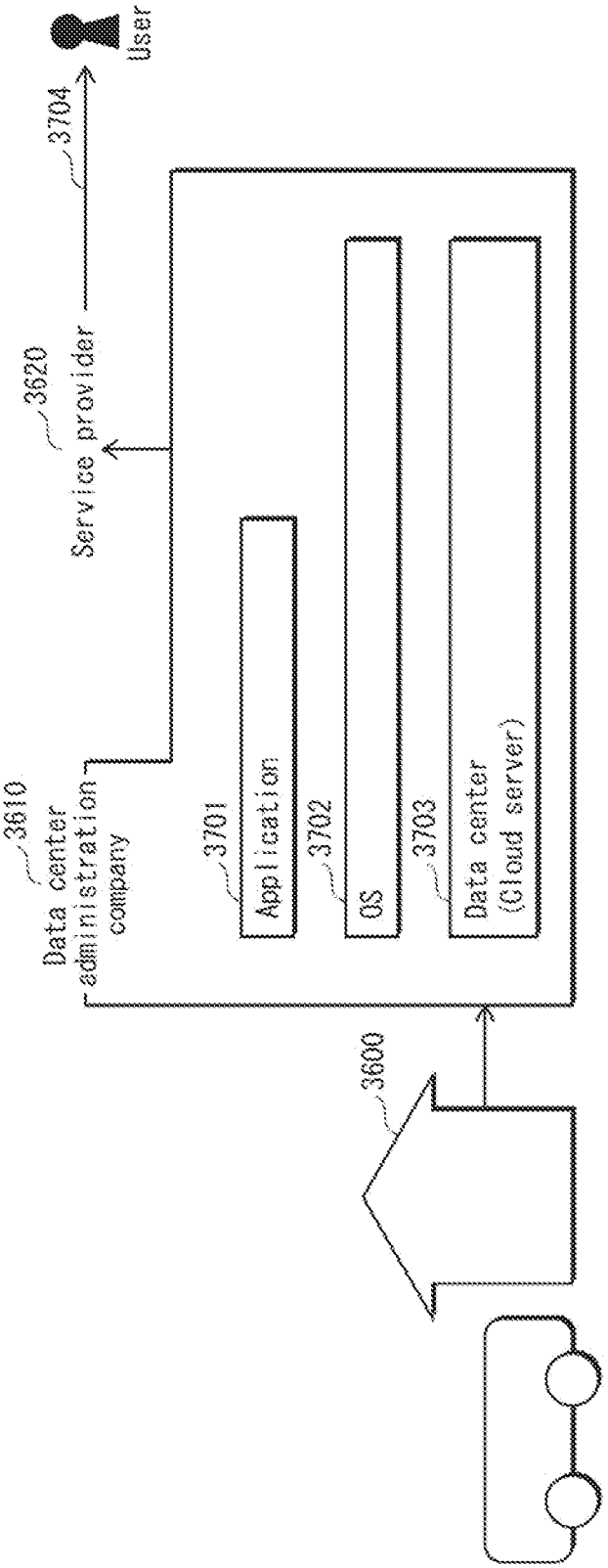

User
3704
3620
Service provider
3610
Data center administration company
3701
Application
3702
OS
3703
Data center (Cloud server)
3600

FIG. 41

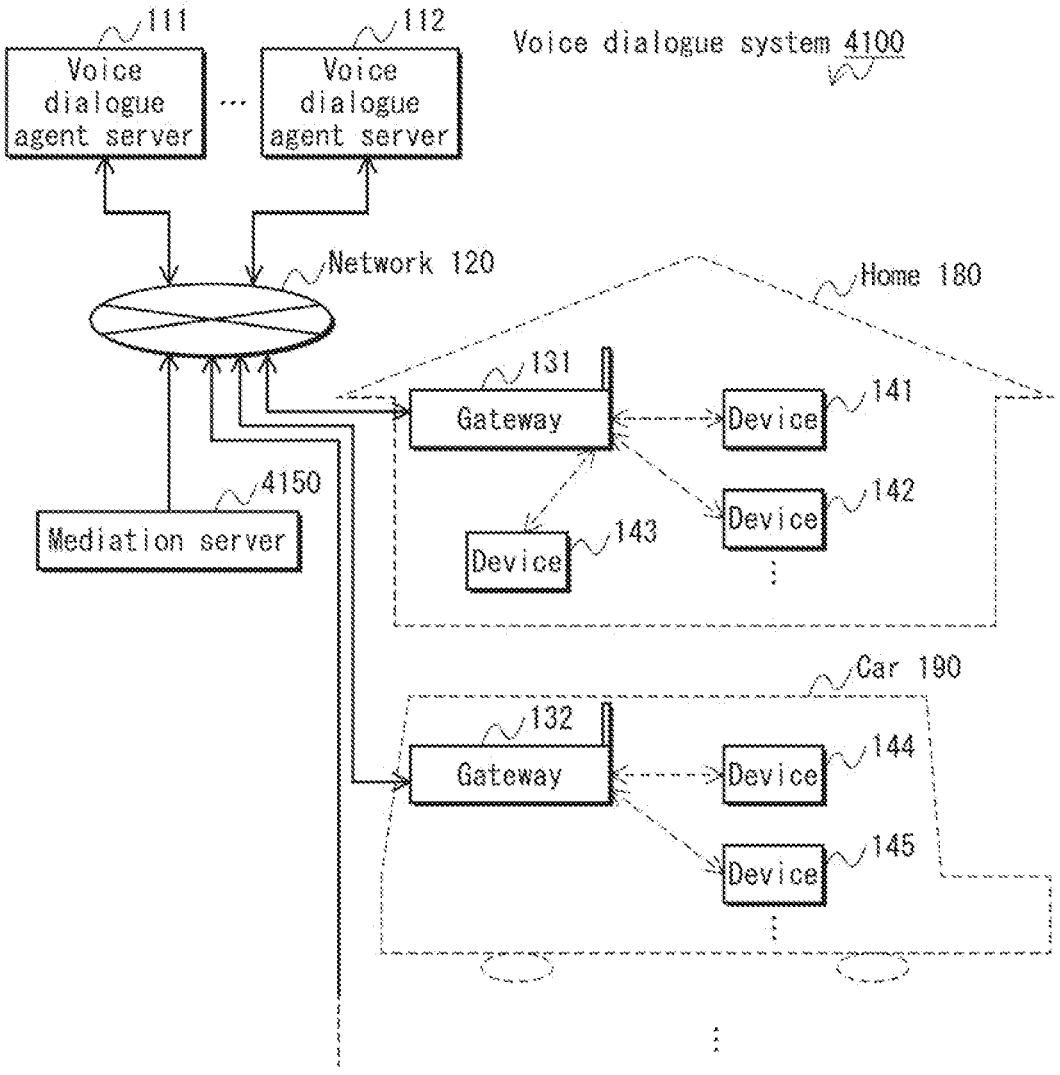

111
Voice dialogue agent server
112
Voice dialogue agent server
Voice dialogue system 4100
Network 120
Home 180
131
Gateway
141
Device
142
Device
143
Device
4150
Mediation server
Car 190
132
Gateway
144
Device
145
Device

FIG. 42

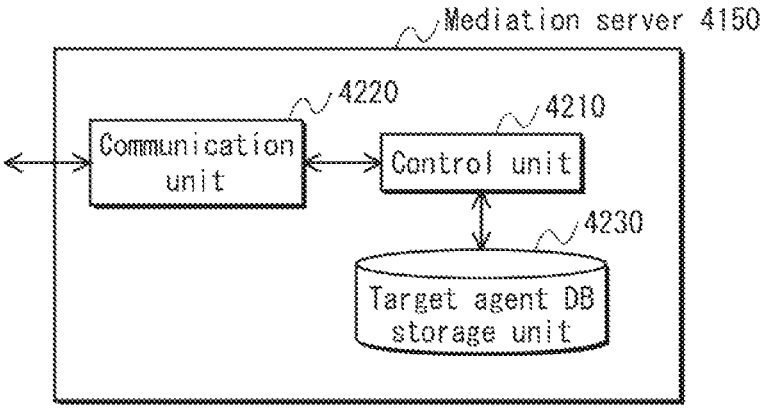

Mediation server 4150
4220
4210
Communication unit
Control unit
4230
Target agent DB storage unit

FIG. 43

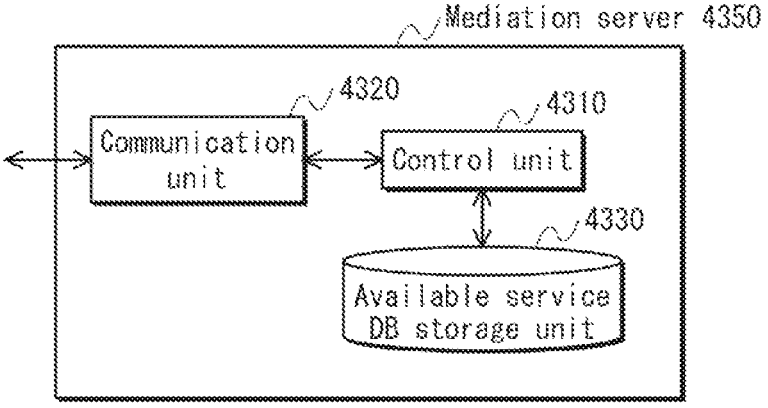

Mediation server 4350
4320
4310
Communication unit
Control unit
4330
Available service DB storage unit

FIG. 44A

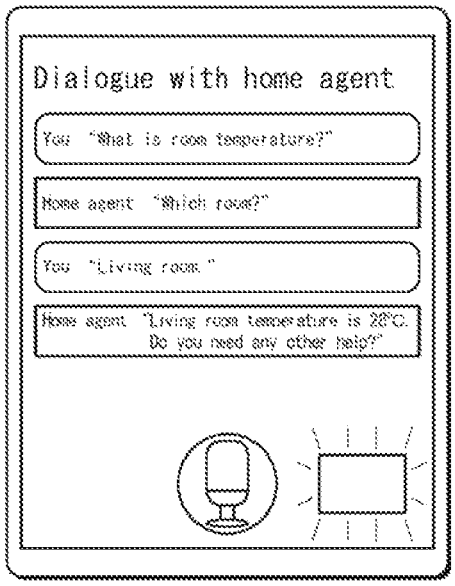


FIG. 44B

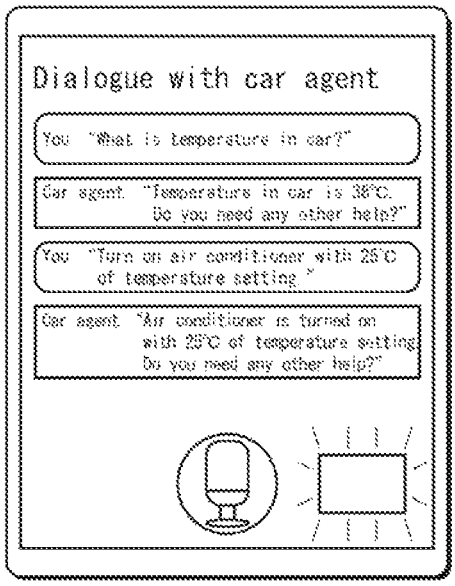


FIG. 44C

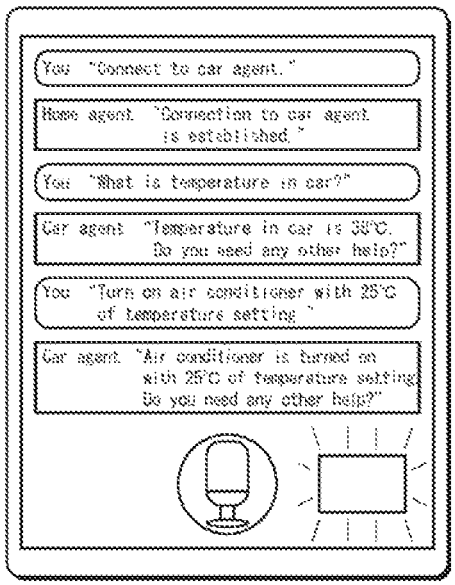


FIG. 44D

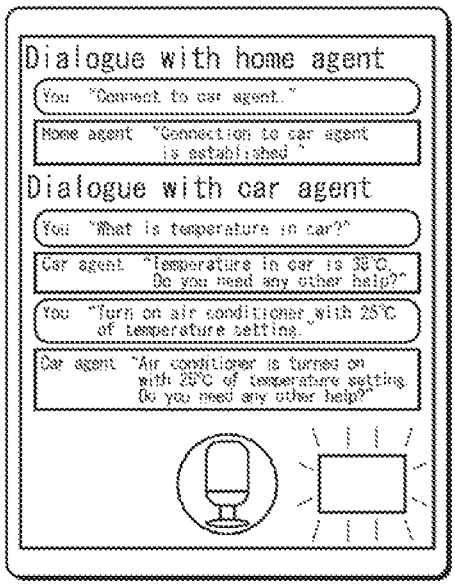


FIG. 45A

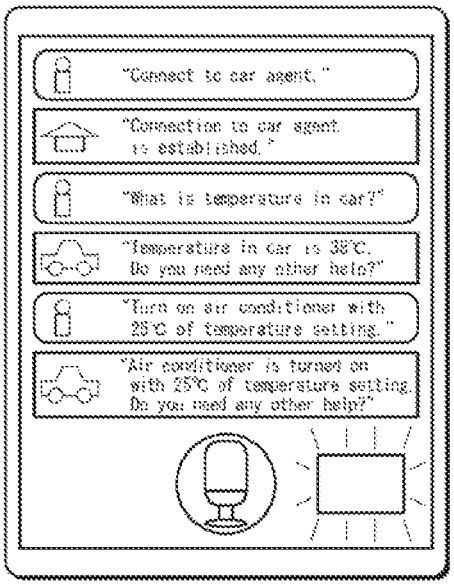


FIG. 45B

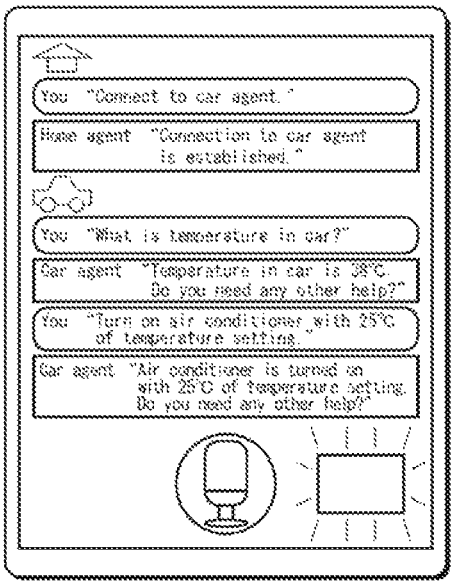
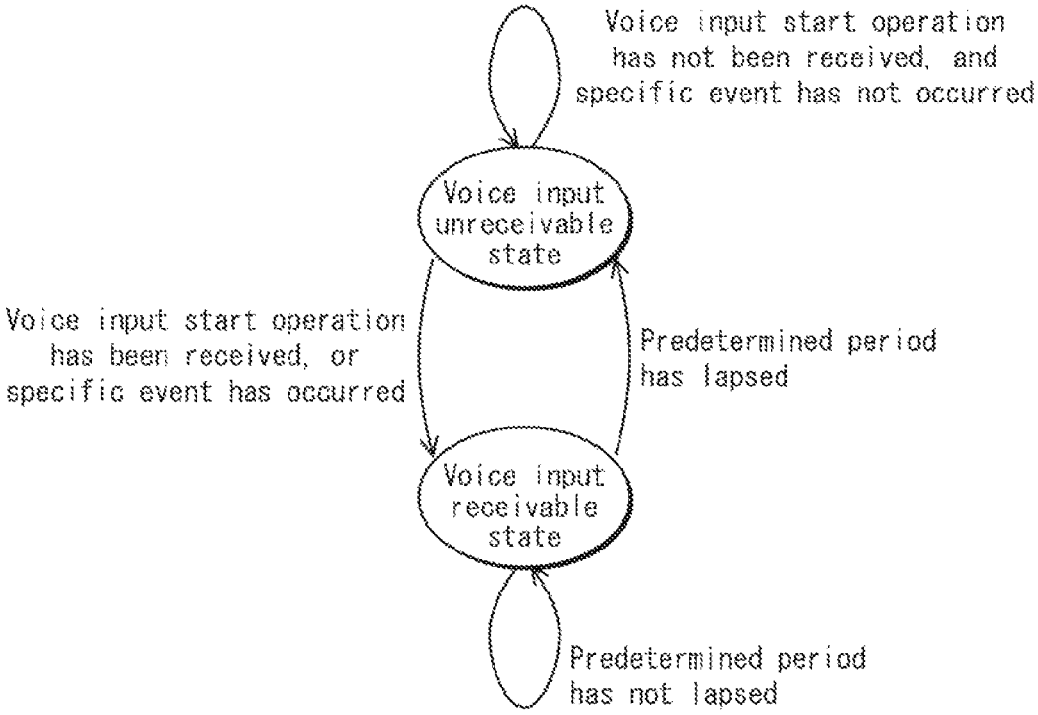
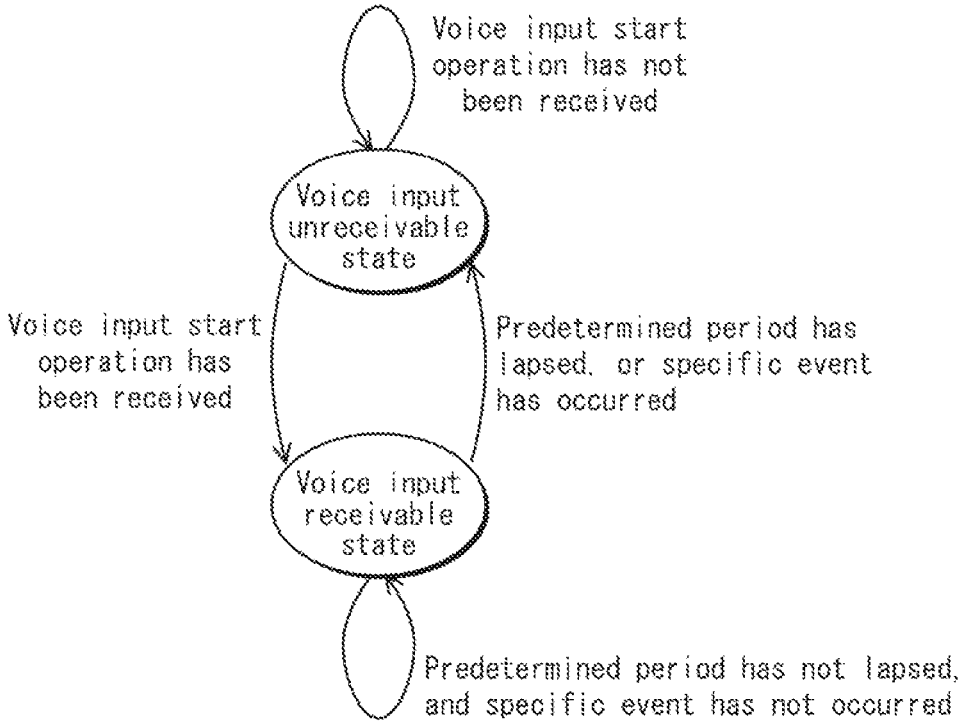


FIG. 46



Example of specific event
·Response has been received from agent

FIG. 47



Example of specific event
·End of character strings is reached
·No voice is input for certain period
·Specific voice is input
·Input is prohibited by agent
·Disconnected from agent

FIG. 48

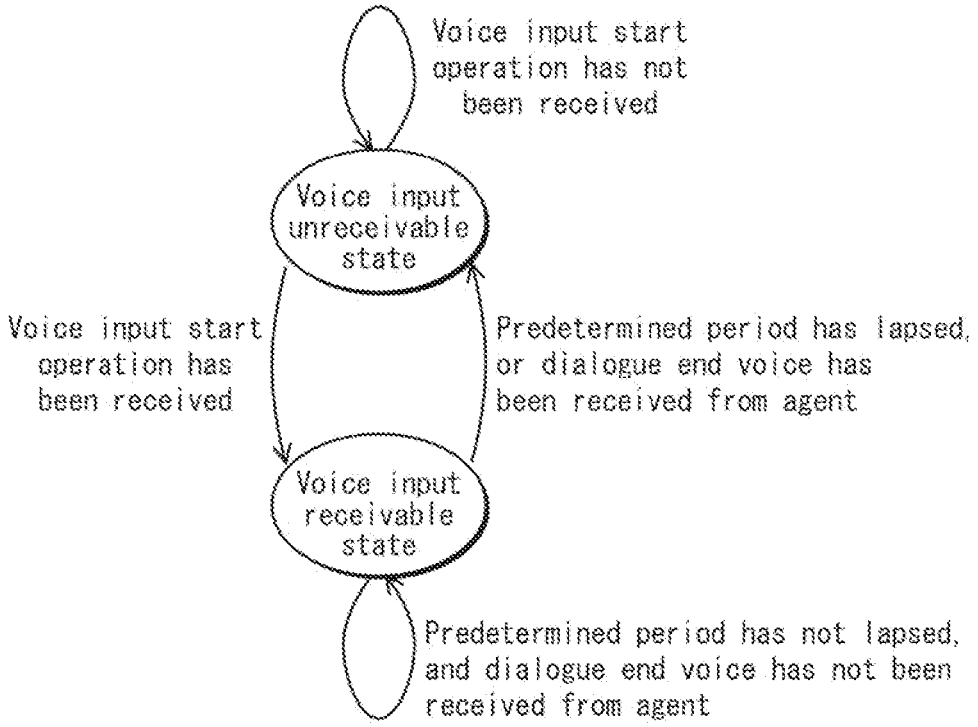

Voice input start operation has not been received
Voice input unreceivable state
Voice input start operation has been received
Predetermined period has lapsed, or dialogue end voice has been received from agent
Voice input receivable state
Predetermined period has not lapsed, and dialogue end voice has not been received from agent

FIG. 49

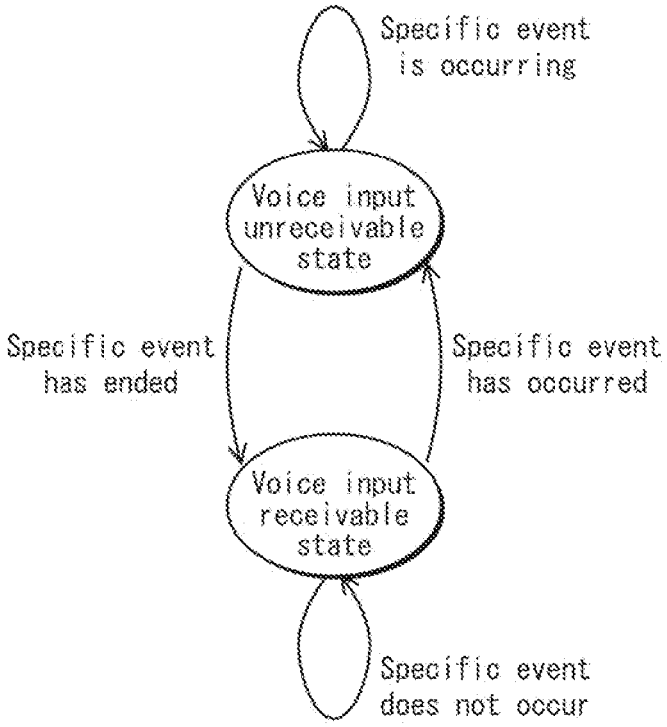
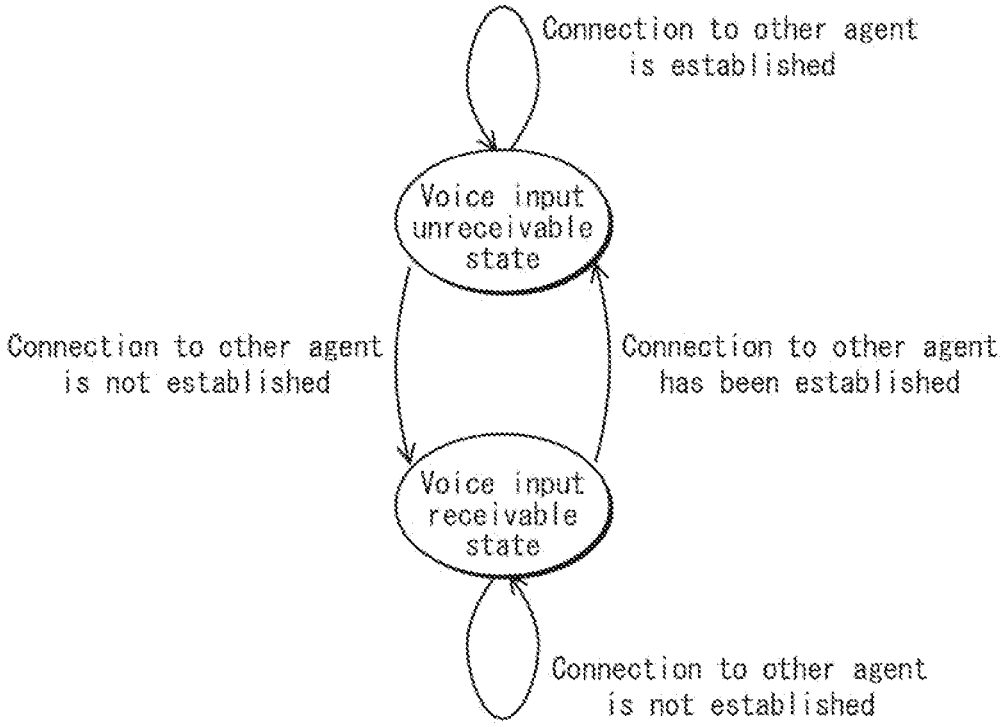

Specific event is occurring
Voice input unreceivable state
Specific event has ended
Specific event has occurred
Voice input receivable state
Specific event does not occur

FIG. 50


Connection to other agent is established
Voice input unreceivable state
Connection to other agent is not established
Connection to other agent has been established
Voice input receivable state
Connection to other agent is not established

VOICE INTERACTION METHOD, AND DEVICE

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

[This application claims benefit to the provisional U.S. Application No. 61/836,763, filed on Jun. 19, 2013.] *This application is a reissue of U.S. Pat. No. 9,564,129, which issued on Feb. 7, 2017 from application Ser. No. 14/777,920, filed Sep. 17, 2015, which is the National Stage of International Application No. PCT/JP2014/003097, filed Jun. 10, 2014, which claims the benefit of U.S. Provisional Application No. 61/836,763, filed Jun. 19, 2013.*

TECHNICAL FIELD

The present invention relates to a voice dialogue method for performing processing based on a voice that is dialogically input.

BACKGROUND ART

There has conventionally been known a voice dialogue system that includes voice input interface and performs processing based on a voice that is dialogically input by a user.

For example, Patent Literature 1 discloses a headset that includes a microphone, performs voice recognition processing on a voice input through the microphone, and performs processing based on a result of the voice recognition processing.

Also, Patent Literature 2 discloses a voice dialogue system that includes an agent that performs processing based on a voice that is dialogically input by a user.

CITATION LIST

Patent Literature

[Patent Literature 1] Japanese Patent Application Publication No. 2004-233794

[Patent Literature 2] Japanese Patent Application Publication No. 2008-90545

SUMMARY OF INVENTION

Technical Problem

According to the headset disclosed in Patent Literature 1, it is necessary to perform an operation of pressing a voice recognition control button that is provided in the headset at a start time and an end time of a voice input. Accordingly, in the case where this headset is used as input means in a voice dialogue system that performs processing based on a dialogically input voice, a user of the headset needs to start a voice input by pressing the voice recognition control button and end the voice input by pressing the voice recognition control button for each voice input.

This sometimes makes the user to feel troublesome to perform the operation of pressing the voice recognition control button, which needs to be performed at a start time and an end time of each voice input.

The present invention was made in view of the problem, and aims to provide a voice dialogue method for reducing, in a voice dialogue system, the number of times that a user needs to perform an operation in accordance with a voice that is dialogically input, compared with a conventional technique.

Solution to Problem

In order to solve the above aim, one aspect of the present invention provides a voice dialogue method that is performed by a voice dialogue system, the voice dialogue system including: a voice signal generation unit; a voice dialogue agent unit; a voice output unit; and a voice input control unit, the voice dialogue method comprising: a step of, by the voice signal generation unit, receiving a voice input and generating a voice signal based on the received voice input; a step of, by the voice dialogue agent unit, performing voice recognition processing on the generated voice signal and performing processing based on a result of the voice recognition processing to generate a response signal; a step of, by the voice output unit, outputting a voice based on the generated response signal; and a step of, when the voice output unit outputs the voice, by the voice input control unit, keeping the voice signal generation unit in a receivable state for a predetermined period after output of the voice, the receivable state being a state in which a voice input is receivable.

Advantageous Effects of Invention

According to the above voice dialogue method, in the case where a voice generated by the voice dialogue agent unit is output, a user can input a voice without performing an operation with respect to the voice dialogue system. This reduces the number of times that the user needs to perform an operation in accordance with a voice that is dialogically input, compared with conventional techniques.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a system configuration diagram showing configuration of a voice dialogue system **100**.

FIG. **2** is a block diagram showing functional configuration of a device **140**.

FIG. **3** shows switching of a state managed by a control unit **210**.

FIG. **4** is a block diagram showing functional configuration of a voice dialogue agent **400**.

FIG. **5** is a data structure diagram showing a dialog DB **500**.

FIG. **6** is a flow chart of first device processing.

FIG. **7** is a flow chart of first voice input processing.

FIG. **8** is a flow chart of first agent processing.

FIG. **9** is a flow chart of first instruction execution processing.

FIG. **10** is a procedure diagram in a specific example.

FIG. **11**A to FIG. **11**D are each a pattern diagram showing contents displayed by the device **140**.

FIG. **12** is a pattern diagram showing contents displayed by the device **140**.

FIG. **13** is a block diagram showing functional configuration of a device **1300**.

FIG. **14** shows switching of the state managed by a control unit **1310**.

FIG. **15** is a flow chart of second device processing.

FIG. **16** is a procedure diagram schematically showing a situation in which a dialogue with a voice dialogue agent is performed.

FIG. **17** is a block diagram showing functional configuration of a device **1700**.

FIG. **18** shows switching of the state managed by a control unit **1710**.

FIG. **19** is a flow chart of third device processing.

FIG. **20** is a flow chart of second voice input processing.

FIG. **21** is a procedure diagram schematically showing a situation in which a dialogue with a dialogue agent is performed.

FIG. **22** is a block diagram showing functional configuration of a voice dialogue agent **2200**.

FIG. **23** is a data structure diagram showing a target agent DB **2300**.

FIG. **24** is a flow chart of second agent processing.

FIG. **25** is a flow chart of second instruction execution processing.

FIG. **26** is a flow chart of first connection response processing.

FIG. **[26]** *27* is a flow chart of disconnection response processing.

FIG. **28** is a flow chart of third agent processing.

FIG. **29** is a procedure diagram schematically showing a situation in which a dialogue with a voice dialogue agent is performed.

FIG. **30** is a block diagram showing functional configuration of a voice dialogue agent **3000**.

FIG. **31** is a data structure diagram showing an available service DB **3100**.

FIG. **32** is a flow chart of fourth agent processing.

FIG. **33** is a flow chart of third instruction execution processing.

FIG. **34** is a flow chart of second connection response processing.

FIG. **35** is a procedure diagram schematically showing a situation in which a dialogue with a voice dialogue agent is performed.

FIG. **36**A is a diagram schematically showing an operation situation of the voice dialogue system, FIG. **36**B and FIG. **36**C are each a diagram schematically showing a data center administration company **3610**.

FIG. **37** is a diagram schematically showing service type 1.

FIG. **38** is a diagram schematically showing service type 2.

FIG. **39** is a diagram schematically showing service type 3.

FIG. **40** is a diagram schematically showing service type 4.

FIG. **41** is a system configuration diagram showing configuration of a voice dialogue system **4100**.

FIG. **42** is a block diagram showing functional configuration of a mediation server **4150**.

FIG. **43** is a block diagram showing functional configuration of a mediation server **4350**.

FIG. **44**A to FIG. **44**D each show an example of an image displayed by a display unit.

FIG. **45**A and FIG. **45**B each show an example of an image displayed by the display unit.

FIG. **46** shows an example of switching of the state.

FIG. **47** shows an example of switching of the state.

FIG. **48** shows an example of switching of the state.

FIG. **49** shows an example of switching of the state.

FIG. **50** shows an example of switching of the state.

DESCRIPTION OF EMBODIMENTS

Embodiment 1

<Outline>

The following explains, as one aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention, a voice dialogue system including devices that are disposed in a home, a car, and so on and a voice dialogue agent server that communicates the devices.

In the voice dialogue system, the voice dialogue agent server embodies a voice dialogue agent by executing a program stored therein. The voice dialogue agent makes a voice dialogue via a device (input and output via a voice) with a user of the voice dialogue system. The voice dialogue agent performs processing that reflects details of the dialogue, and performs a voice output of a result of the processing via the device of the user.

In the case where the user hopes to make a dialogue with the voice dialogue agent (hopes to perform a voice input with respect to the voice dialogue agent), the user performs a predetermined voice input start operation with respect to the device constituting the voice dialogue system. The device is switched to a state in which voice input is receivable for a predetermined period after the voice input start operation. While the device is in the state in which voice input is receivable, the user performs voice input with respect to the voice dialogue agent.

The following explains the details of the voice dialogue system with reference to the drawings.

<Configuration>

FIG. **1** is a system configuration diagram showing configuration of a voice dialogue system **100**.

As shown in the figure, the voice dialogue system **100** includes voice dialogue agent servers **110**a and **110**b, a network **120**, gateways **130**a and **130**b, and devices **140**a-**140**e.

While the gateway **130**a and the devices **140**a-**140**c are disposed in a home **180**, the gateway **130**b and the devices **140**d and **140**e are disposed in a car **190**.

The gateways **130**a and **130**b are hereinafter just referred to as a gateway **130** except in the case of explicit distinction. Also, the voice dialogue agent servers **110**a and **110**b are hereinafter just referred to as a voice dialogue agent server **110** except in the case of explicit distinction. The devices **140**a-**140**e each have a function of performing a wireless or wired communication with the gateway **130** and a function of performing a wireless or wired communication with the voice dialogue agent server **110**.

The devices **140**a-**140**c, which are disposed in the home **180**, are each for example a television, an air conditioner, a recorder, a washing machine, a portable smartphone, or the like that is disposed in the home **180**. The devices **140**d-**140**e, which are disposed in the car **190**, are each for example a car air conditioner, a car navigation system, or the like that is disposed in the car **190**.

Here, explanation is provided on a virtual device **140** that has functions the devices **140**a-**140**e commonly have, instead of separate explanations of the devices **140**a-**140**e.

FIG. **2** is a block diagram showing functional configuration of the device **140**.

As shown in the figure, the device **140** includes a control unit **210**, a voice input unit **220**, an operation reception unit **230**, an address storage unit **240**, a communication unit **250**, a voice output unit **260**, a display unit **270**, and an execution unit **280**.

The voice input unit **220** is for example embodied by a microphone and a processor that executes programs. The voice input unit **220** is connected to the control unit **210**, and is controlled by the control unit **210**. The voice input unit **220** has a function of receiving a voice input from a user and generating a voice signal (hereinafter, referred to also as input voice data).

The voice input unit **220** is in either a voice input receivable state or a voice input unreceivable state under the control by the control unit **210**. In the voice input receivable state, the voice input unit **220** is able to receive a voice input. In voice input unreceivable state, the voice input unit **220** is unable to receive a voice input.

The operation reception unit **230** is for example embodied by a touchpanel, a touchpanel controller, and a processor that executes programs. The operation reception unit **230** is connected to the control unit **210**, and is controlled by the control unit **210**. The operation reception unit **230** has a function of receiving a predetermined contact operation performed by the user and generating an electrical signal based on the received contact operation.

The predetermined contact operation performed by the user, which is received by the operation reception unit **230**, includes a predetermined voice input start operation indicating that a voice input using the voice input unit **220** is to be started.

The voice input start operation is for example assumed to be an operation of contacting an icon for receiving the voice input start operation that is displayed on the touchpanel which is part of the operation reception unit **230**. Also, the voice input start operation is for example assumed to be an operation of pressing a button for receiving the voice input start operation that is included in the operation reception unit **230**.

The address storage unit **240** is for example embodied by a memory and a processor that executes programs, and is connected to the communication unit **250**. The address storage unit **240** has a function of storing therein an IP (Internet Protocol) address of one of the voice dialogue agent servers **110** in the network **120**. Hereinafter, the one voice dialogue agent server **110** is referred to as a specific voice dialogue agent server.

The device **140** is associated with the specific voice dialogue agent server, which is one of the voice dialogue agent servers **110**.

Note that the memory included in the device **140** is for example a RAM (Random Access Memory), a ROM (Read Only Memory), a flash memory, or the like.

The communication unit **250** is for example embodied by a processor that executes programs, a communication LSI (Large Scale Integration), and an antenna. The communication unit **250** is connected to the control unit **210** and the address storage unit **240**, and is controlled by the control unit **210**. The communication unit **250** has a gateway communication function and a voice dialogue agent server communication function described below.

The gateway communication function is a function of performing a wireless or wired communication with the gateway **130**.

The voice dialogue agent server communication function is a function of communicating with the voice dialogue agent server **110** via the gateway **130** and the network **120**.

Here, in communication with any one of the voice dialogue agent servers **110**, in the case where the control unit **210** does not designate a specific one of the voice dialogue agent servers **110** as a voice dialogue agent server **110** that is a communication party, the communication unit **250** communicates with a specific voice dialogue agent server with reference to an IP address stored in the address storage unit **240**.

The voice output unit **260** is for example embodied by a processor that executes programs and a speaker. The voice output unit **220** is connected to the control unit **210**, and is controlled by the control unit **210**. The voice output unit **260** has a function of converting an electrical signal, which is transmitted from the control unit **210**, to a voice and outputting the voice.

The display unit **270** is for example embodied by a touchpanel, a touchpanel controller, and a processor that executes programs. The display unit **270** is connected to the control unit **210**, and is controlled by the control unit **210**. The display unit **270** has a function of displaying images, character strings, and the like based on the electrical signal, which is transmitted from the control unit **210**.

The execution unit **280** is a functional block that achieves a function the device **140** as a device originally has. In the case where the device **140** is for example a television, the function is a function of receiving and decoding a television signal, displaying television images resulting from the decoding on a display, and outputting television audio resulting from the decoding via a speaker. In the case where the device **140** is for example an air conditioner, the function is a function of blowing cool air or warm air through a duct to bring a temperature in a room in which the air conditioner is disposed to a set temperature. The execution unit **280** is connected to the control unit **210**, and is controlled by the control unit **210**.

In the case where the device **140** is for example a television, the execution unit **280** is embodied by a television signal receiver, a television signal tuner, a television signal decoder, a display, a speaker, and so on.

Also, the execution unit **280** does not necessarily need to have a configuration in which all compositional elements thereof are included in a single housing. In the case where the device **140** is for example a television, the execution unit **280** is assumed to have for example a configuration in which a remote controller and the display are included in separate housings. Similarly, functional blocks of the device **140** each do not need to have a configuration in which all compositional elements thereof are included in a single housing.

The control unit **210** is for example embodied by a processor that executes programs. The control unit **210** is connected to the voice input unit **220**, the operation reception unit **230**, the communication unit **250**, the voice output unit **260**, the display unit **270**, and the execution unit **280**. The control unit **210** has a function of controlling the voice input unit **220**, a function of controlling the operation reception unit **230**, a function of controlling the communication unit **250**, a function of controlling the voice output unit **260**, a function of controlling the display unit **270**, and a function of controlling the execution unit **280**. The control unit **210** further has a voice input unit state management function and a first device processing execution function described below.

The voice input unit state management function is a function of managing the state of the voice input unit **220**, which is either the voice input receivable state or the voice input unreceivable state.

FIG. **3** shows switching of the state managed by the control unit **210**.

As shown in the figure, in the case where the state is the voice input unreceivable state, (1) the control unit **210** keeps the state to the voice input unreceivable state until the operation reception unit **230** receives a voice input start

operation. (2) After the reception of the voice input start operation by the operation reception unit **230**, the control unit **210** switches the state to the voice input receivable state. Then, in the case where the state is the voice input receivable state, (3) the control unit **210** keeps the state to the voice input receivable state until a predetermined period T**1** (for example, five seconds) has lapsed after the switching of the state to the voice input receivable state. (4) After the lapse of the predetermined period T**1**, the control unit **210** switches the state to the voice input unreceivable state.

Note that upon bootup of the device **140**, the control unit **210** starts managing the state as the voice input unreceivable state.

Returning to FIG. **2**, the explanation on the control unit **210** is continued.

The first device processing execution function is a function performed by the control unit **210** controlling the voice input unit **220**, the operation reception unit **230**, the communication unit **250**, the voice output unit **260**, the display unit **270**, and the execution unit **280** to cause the device **140** to execute the first device processing as its characteristic operation to execute a sequence of processing described below. In the sequence of processing, (1) when the user performs a voice input start operation, (2) the device **140** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, and (5) outputs a voice based on the received response voice data.

Note that the first device processing is explained in detail in section <First Device Processing> later with reference to a flow chart.

Referring back to FIG. **1**, the explanation on the device **140** is continued.

The gateway **130** is for example embodied by a personal computer or the like having a communication function, and is connected to the network **120**. The gateway **130** has the following functions achieved by executing programs stored therein: a function of performing a wireless or wired communication with the device **140**; a function of communicating with the voice dialogue agent server **110** via the network **120**; and a function of relaying communication between the device **140** and the voice dialogue agent server **110**.

The voice dialogue agent server **110** is for example embodied by a server, which is composed of one or more computer systems and has a communication function. The voice dialogue agent server **110** is connected to the network **120**. The voice dialogue agent server **110** has the following functions achieved by executing programs stored therein: a function of communicating with another device which is connected to the network **120**; a function of communicating with the device **140** via the gateway **130**; and a function of embodying the voice dialogue agent **400**.

FIG. **4** is a block diagram showing functional configuration of the voice dialogue agent **400** embodied by the voice dialogue agent server **110**.

As shown in the figure, the voice dialogue agent **400** includes a control unit **410**, a communication unit **420**, a voice recognition processing unit **430**, a dialogue DB (Date Base) storage unit **440**, a voice synthesizing processing unit **450**, and an instruction generation unit **460**.

The communication unit **420** is for example embodied by a processor that executes programs and a communication LSI. The communication unit **420** is connected to the control unit **410**, the voice recognition processing unit **430**, and the voice synthesizing processing unit **450**, and is controlled by the control unit **410**. The communication unit **420** has a function of communicating with another device which is connected to the network **120** and a function of communicating with the device **140** via the gateway **130**.

The voice recognition processing unit **430** is embodied by a processor that executes programs. The voice recognition processing unit **430** is connected to the control unit **410** and the communication unit **420**, and is controlled by the control unit **410**. The voice recognition processing unit **430** has a function of performing voice recognition processing on input voice data received by the communication unit **420** to convert the voice data to a character string (hereinafter, referred to also as an input text).

The voice synthesizing processing unit **450** is for example embodied by a processor that executes programs. The voice synthesizing processing unit **450** is connected to the control unit **410** and the communication unit **420**, and is controlled by the control unit **410**. The voice synthesizing processing unit **450** has a function of performing voice synthesizing processing on a character sting transmitted from the control unit **410** to convert the character string to voice data.

The dialogue DB storage unit **440** is for example embodied by a memory and a processor that executes programs. The dialogue DB storage unit **440** is connected to the control unit **410**, and has a function of storing therein a dialog DB **500**.

FIG. **5** is a data structure diagram showing the dialog DB **500** stored in the dialogue DB storage unit **440**.

As shown in the figure, the dialog DB **500** includes keyword **510**, target device **520**, startup application **530**, processing details **540**, and response text **550** that are associated with each other.

The keyword **510** indicates a character string that is assumed to be included in an input text converted by the voice recognition processing unit **430**.

The target device **520** indicates information for specifying a device that is to execute processing specified by the associated processing details **540**, which are described later.

Here, the device specified by the target device **520** may be the voice dialogue agent **400**.

The startup application **530** is information for specifying an application program to be started up in a device specified by the associated target device **520** in order to cause the specified device to execute processing specified by the associated processing details **540**, which are described later.

The processing details **540** are information for specifying, in the case where a character string indicated by the associated keyword **510** is included in an input text that is converted by the voice recognition processing unit **430**, processing that is determined to be executed by a device that is specified by the associated target device **520**.

The response text **550** is information for indicating, in the case where processing specified by the associated processing details **540** is executed, a character string that is determined to be generated based on a result of the processing (hereinafter, referred to also as a response text).

Referring back to FIG. **4**, the explanation on the voice dialogue agent **400** is continued.

The instruction generation unit **460** is for example embodied by a processor that executes programs. The instruction generation unit **460** is connected to the control unit **410**, and is controlled by the control unit **410**. The instruction generation unit **460** has a function of, upon reception of a group of the target device **520**, the startup application **530**, and the processing details **540** transmitted from the control unit **410**, starting up an application program that is specified by the startup application **530** included in a device that is specified by the target device **520**, and generating an instruction set for

causing the specified device to execute processing that is specified by the processing details **540**.

The control unit **410** is for example embodied by a processor that executes programs. The control unit **410** is connected to the communication unit **420**, the voice recognition processing unit **430**, the dialogue DB storage unit **440**, the voice synthesizing processing unit **450**, and the instruction generation unit **460**. The control unit **410** has a function of controlling the communication unit **420**, a function of controlling the voice recognition processing unit **430**, a function of controlling the voice synthesizing processing unit **450**, and a function of controlling the instruction generation unit **460**. The control unit **410** further has an input text return function, an instruction generation function, an instruction execution function, and a first agent processing execution function described below.

The input text return function is a function of controlling, in the case where input voice data received by the communication unit **420** is converted to an input text by the voice recognition processing unit **430**, the communication unit **420** to return the input text to the device **140** which has transmitted the input voice data.

The instruction generation function is a function of, upon reception of the input text transmitted from the voice recognition processing unit **430**, controlling the instruction generation unit **460** to generate an instruction set: by (1) referring to the dialog DB **500** stored in the dialogue DB storage unit **440** to read, based on the keyword **510** included in the input text, the target device **520**, the startup application **530**, the processing details **540**, and the response text **550**, which are associated with the keyword **510**; and (2) transmitting a group of the read target device **520**, startup application **530**, and processing details **540** to the instruction generation unit **460**.

The instruction execution function is a function of executing an instruction set generated by the instruction generation unit **460**, generating a response text specified by the response text **550** based on an execution result of the instruction set, and transmitting the generated response text to the voice synthesizing processing unit **450**.

In execution of the instruction execution function, the control unit **410** generates a response text by communicating with a device specified by the target device **520** with use of the communication unit **420** to cause the specified device to execute the instruction set and transmit an execution result of the instruction set.

The first agent processing execution function is a function performed by the control unit **410** controlling the communication unit **420**, the voice recognition processing unit **430**, the voice synthesizing processing unit **450**, and the instruction generation unit **460** to cause the voice dialogue agent **400** to execute first agent processing that is its characteristic operation to execute a sequence of processing described below. In the sequence of processing, (1) the voice dialogue agent **400** receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) generates an instruction set based on the generated input text, and executes the generated instruction set (4) generates a response text based on an execution result of the instruction set, (5) converts the generated response text to response voice data, and (6) returns the response text and the response voice data to the device.

Note that the first agent processing is explained in detail in section <First Agent Processing> later with reference to a flow chart.

Here, assume a case for example where an input text "Where is Mr. A's address?" is transmitted from the voice recognition processing unit **430**. In this case, with reference to the dialog DB **500** stored in the dialogue DB storage unit **440**, the control unit **410** causes a device "smartphone" specified by the target device **520** to start up an application program "Contact information" specified by the startup application **530** and execute processing of "Check Mr. A's address" specified by the processing details **540**, and generates a response text "Mr. A's address is XXXX." based on an execution result of the processing.

The following explains the operation of the voice dialogue system **100** having the above configuration, with reference to the drawings.

<Operation>

The voice dialogue system **100** performs, as its characteristic operation, the first device processing and the first agent processing.

Explanation is given below on the processing in order.

<First Device Processing>

The first device processing is processing performed by the device **140**. In the first device processing, (1) when the user performs a voice input start operation, (2) the device **140** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, and (5) outputs a voice based on the received response voice data.

FIG. **6** is a flow chart of the first device processing.

Upon bootup of the device **140**, the first device processing is started.

At a time of bootup of the device **140**, the state managed by the control unit **210** is the voice input unreceivable state.

When the first device processing is started, the control unit **210** stands by until the operation reception unit **230** receives a voice input start operation performed by a user of the voice dialogue system **100** (Step S**600**: Repetition of No). When the operation reception unit **230** receives the voice input start operation (Step S**600**: Yes), the control unit **210** switches the state from the voice input unreceivable state to the voice input receivable state (Step S**610**), and causes the display unit **270** to display that the state is the voice input receivable state (Step S**620**).

FIG. **11**A is a pattern diagram showing an example of a situation in which in the case where the device **140** is for example a smartphone, the display unit **270** displays that the state is the voice input receivable state.

In the figure, a touchpanel **1110** that constitutes the smartphone is part of the display unit **270**. The touchpanel **1110** displays that the state is the voice input receivable state by blinking a region **1120** that is positioned at the lower right in the touchpanel **1110** (for example by alternately lighting black color and white color in the region **1120**).

Referring back to FIG. **6**, the explanation on the first device processing is continued.

After the end of the processing in Step S**620**, the device **140** executes first voice input processing (Step S**630**).

FIG. **7** is a flow chart of the first voice input processing.

When the first voice input processing is started, the voice input unit **220** receives a voice input from a user, and generates input voice data (Step S**700**). Then, when a predetermined period T**1** has lapsed after switching of the state to the voice input receivable state (Step S**710**: Yes after repetition of No), the control unit **210** switches the state from the voice input receivable state to the voice input

unreceivable state (Step S720), and causes the display unit 270 to stop displaying that the state is the voice input receivable state (Step S730).

Then, the control unit 210 controls the communication unit 250 to transmit the input voice data, which is generated by the voice input unit 220, to the voice dialogue agent 400 which is embodied by a specific voice dialogue agent server (Step S740).

After the end of the processing in Step S740, the device 140 ends the first voice input processing.

Referring back to FIG. 6 again, the explanation on the first device processing is continued.

After the end of the first voice input processing, the control unit 210 stands by until the communication unit 250 receives an input text that is returned from the voice dialogue agent 400 in response to the input voice data transmitted in the processing in Step S740 (Step S640: Repetition of No).

Here, the input text is a character string resulting from conversion of the input voice data transmitted in the processing in Step S740 performed by the voice dialogue agent 400.

When the communication unit 250 receives the input text (Step S640: Yes), the display unit 270 displays the input text (Step S650).

FIG. 11B is a pattern diagram showing an example of a situation in which in the case where the device 140 is for example a smartphone, the display unit 270 displays an input text.

In the figure, an example is shown in which the input text is a character string "What is room temperature?". As shown in the figure, the input text, which is the character string "What is room temperature?" is displayed on the touchpanel 1110, which is part of the display unit 270, together with a character string "You".

Referring back to FIG. 6 again, the explanation on the first device processing is continued.

After the end of the processing in Step S650, the control unit 210 stands by until the communication unit 250 receives a response text and response voice data that are returned from the voice dialogue agent 400 in response to the input voice data transmitted in the processing in Step S740 (Step S640: Repetition of No).

When the communication unit 250 receives the response text and the response voice data (Step S660: Yes), the display unit 270 displays the response text (Step S670), and the voice output unit 260 converts the response voice data to a voice and outputs the voice (Step S680).

FIG. 11C is a pattern diagram showing an example of a situation in which in the case where the device 140 is for example a smartphone, the display unit 270 displays a response text.

In the figure, an example is shown in which the response text is a character string "Which room?". As shown in the figure, the response text, which is the character string "Which room?", is displayed on the touchpanel 1110 which is part of the display unit 270, together with a character string "Home agent".

Referring back to FIG. 6 again, the explanation on the first device processing is continued.

After the end of the processing in Step S680, the device 140 ends the first device processing.

<First Agent Processing>

The first agent processing is processing performed by the voice dialogue agent 400. In the first agent processing, (1) the voice dialogue agent 400 receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) generates an instruction set based on the generated input text, and executes the generated instruction set, (4) generates a response text based on an execution result of the instruction set, (5) converts the generated response text to response voice data, and (6) returns the response text and the response voice data to the device.

FIG. 8 is a flow chart of the first agent processing.

Upon bootup of the voice dialogue agent 400, the first agent processing is started.

When the first agent processing is started, the voice dialogue agent 400 stands by until the communication unit 420 receives input voice data transmitted from the device 140 (Step S800: Repetition of No). When the communication unit 420 receives the input voice data (Step S800: Yes), the voice dialogue agent 400 performs first instruction execution processing (Step S810).

FIG. 9 is a flow chart of the first instruction execution processing.

When the first instruction execution processing is started, the voice recognition processing unit 430 performs voice recognition processing on the input voice data, which is received by the communication unit 420, to convert the input voice data to an input text that is a character string (Step S900).

After the conversion to the input text, the control unit 410 controls the communication unit 420 to return the converted input text to the device 140 which has transmitted the input voice data (Step S910).

The control unit 410 controls the instruction generation unit 460 to generate an instruction set by: (1) referring to the dialog DB 500 stored in the dialogue DB storage unit 440 to read, based on the keyword 510 included in the input text, the target device 520, the startup application 530, the processing details 540, and the response text 550, which are associated with the keyword 510; and (2) transmitting a group of the read target device 520, startup application 530, and processing details 540 to the instruction generation unit 460.

After the generation of the instruction set, the control unit 410 executes the generated instruction set (Step S930), and generates a response text specified by the response text 550 based on an execution result of the instruction set (Step S940). Here, the control unit 410 generates a response text by communicating with a device specified by the target device 520 with use of the communication unit 420 to cause the specified device to execute part of the instruction set and transmit an execution result of the part of the instruction set.

After the generation of the response text, the voice synthesizing processing unit 450 performs voice synthesizing processing on the generated response text to generate response voice data (Step S950).

After the generation of the response voice data, the control unit 410 controls the communication unit 420 to transmit the generated response text and response voice data to the device 140 which has transmitted the input voice data (Step S960).

After the end of the processing in Step S960, the voice dialogue agent 400 ends the first instruction execution processing.

Referring back to FIG. 8, the explanation on the first agent processing is continued.

After the end of the first instruction execution processing, the voice dialogue agent 400 returns to the processing in Step S800 to perform the processing in Step S800 and the subsequent steps.

The following explains a specific example of the operation performed by the voice dialogue system **100** having the above configuration, with reference to the drawing.

<Specific Example>

FIG. **10** is a procedure diagram schematically showing a situation in which the user of the voice dialogue system **100** makes a voice dialogue with the voice dialogue agent **400** with use of the device **140** (here, a smartphone), and the voice dialogue agent **400** performs processing that reflects details of the dialogue.

When the user performs a voice input start operation (Step S**1000**, corresponding to Step S**600**: Yes in FIG. **6**), the state is switched to the voice input receivable state (Step S**1005**, corresponding to Step S**610** in FIG. **6**), and the device **140** performs first voice input processing (Step S**1010**, corresponding to Step S**630** FIG. **6**).

FIG. **11**A is a diagram schematically showing an example of a situation in which, while the state is the voice input receivable state in the first voice input processing, the touchpanel **1110**, which is part of the display unit **270** included in the device **140** which is a smartphone, displays that the state is the voice input receivable state by blinking the region **1120**.

Referring back to FIG. **10**, the explanation on the specific example is continued.

In the first voice input processing, in the case where the user inputs a voice "What is room temperature?", the device **140** transmits input voice data "What is room temperature?" to the voice dialogue agent **400** (corresponding to Step S**740** in FIG. **7**).

Then, the voice dialogue agent **400** receives the input voice data (corresponding to Step S**800**: Yes in FIG. **8**), and performs first instruction execution processing (Step S**1060**, corresponding to Step S**810** in FIG. **8**).

Here, in the first instruction execution processing, in the case where the voice dialogue agent **400** generates response voice data "Which room?", the voice dialogue agent **400** transmits the response voice data "Which room?" to the device **140** (corresponding to Step S**960** in FIG. **9**).

Then, the device **140** receives the response voice data (corresponding to Step S**660**: Yes in FIG. **6**), and outputs a voice "Which room?" (Step S**1015**, corresponding to Step S**680** in FIG. **6**).

In the processing in Step S**1010**, when the predetermined period T**1** has lapsed after the switching of the state to the voice input receivable state, the state is switched again to the voice input unreceivable state (corresponding to Step S**720** in FIG. **7**). Accordingly, the user, who has heard the voice "Which room?" which is output from the device **140**, performs a new voice input start operation with respect to the device **140** to newly input a voice (Step S**1020**, corresponding to Step S**600**: Yes in FIG. **6**). Then, the state is switched to the voice input receivable state (Step S**1025**, corresponding to Step S**610** in FIG. **6**), and the device **140** performs first voice input processing (Step S**1030**, corresponding to Step S**630** in FIG. **6**).

FIG. **11**C is a diagram schematically showing an example of a situation in which, while the state is the voice input receivable state in the first voice input processing, the touchpanel **1110**, which is part of the display unit **270** included in the device **140** which is a smartphone, displays that the state is the voice input receivable state by blinking the region **1120**.

Referring back to FIG. **10** again, the explanation on the specific example is continued.

In the first voice input processing, in the case where the user inputs a voice "Living room.", the device **140** transmits input voice data "Living room." to the voice dialogue agent **400** (corresponding to Step S**740** in FIG. **7**).

Then, the voice dialogue agent **400** receives the input voice data (corresponding to Step S**800**: Yes in FIG. **8**), and performs first instruction execution processing (Step S**1065**, corresponding to Step S**810** in FIG. **8**).

Here, in the first instruction execution processing, in the case where the voice dialogue agent **400** generates response voice data "Living room temperature is 28 degrees C. Do you need any other help?", the voice dialogue agent **400** transmits the response voice data "Living room temperature is 28 degrees C. Do you need any other help?" to the device **140** (corresponding to Step S**960**: Yes in FIG. **9**).

Then, the device **140** receives the response voice data (corresponding to Step S**660**: Yes in FIG. **6**), and outputs a voice "Living room temperature is 28 degrees C. Do you need any other help?" (Step S**1035**, corresponding to Step S**680** in FIG. **6**).

In the processing in Step S**1010**, when the predetermined period T**1** has lapsed after the switching of the state to the voice input receivable state, the state is switched again to the voice input unreceivable state (corresponding to Step S**720** in FIG. **7**). Accordingly, the user, who has heard the voice "Living room temperature is 28 degrees C. Do you need any other help?" which is output from the device **140**, performs a new voice input start operation with respect to the device **140** to newly input a voice (Step S**1040**, corresponding to Step S**600**: Yes in FIG. **6**). Then, the state is switched to the voice input receivable state (Step S**1045**, corresponding to Step S**610** in FIG. **6**), and the device **140** performs first voice input processing (Step S**1050**, corresponding to Step S**630** in FIG. **6**).

FIG. **12** is a diagram schematically showing an example where, in the first voice input processing, while the state is the voice input receivable state, the touchpanel **1110**, which is part of the display unit **270** included in the device **140** which is a smartphone, displays that the state is the voice input receivable state by blinking the region **1120**.

Referring back to FIG. **10** again, the explanation on the specific example is continued.

In the first voice input processing, in the case where the user inputs a voice "No. Thank you.", the device **140** transmits input voice data "No. Thank you." to the voice dialogue agent **400** (corresponding to Step S**740** in FIG. **7**).

Then, the voice dialogue agent **400** receives the input voice data (corresponding to Step S**800**: Yes in FIG. **8**), and performs first instruction execution processing (Step S**1070**, corresponding to Step S**810** in FIG. **8**).

Here, in the first instruction execution processing, in the case where the voice dialogue agent **400** generates response voice data "This ends dialogue.", the voice dialogue agent **400** transmits the response voice data "This ends dialogue." to the device **140** (corresponding to Step S**960**: Yes in FIG. **9**).

Then, the device **140** receives the response voice data (corresponding to Step S**660**: Yes in FIG. **6**), and outputs a voice "This ends dialogue." (Step S**1055**, corresponding to Step S**680** in FIG. **6**).

<Consideration>

According to the voice dialogue system **100** having the above configuration, the user switches the state of the device **140** by performing a voice input start operation with respect to the device **140**, and inputs a voice. Then, when the predetermined period T**1** has lapsed, the state of the device **140** is switched to the voice input unreceivable state even if the user does not perform any operation for switching the state of the device **140** to the voice input unreceivable state.

According to the voice dialogue system **100**, therefore, a reduced number of operations need to be performed by the user in accordance with a voice input, compared with a voice dialogue system in which each time a voice input ends, it is necessary to perform an operation for switching the state of the device **140** to the voice input unreceivable state.

Embodiment 2

<Outline>

The following explains, as one aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention, a first modified voice dialogue system that is a partial modification of the voice dialogue system **100** in Embodiment 1.

The voice dialogue system **100** in Embodiment 1 has been explained as an example of the configuration in which when the user performs a voice input start operation, the device **140** is in the voice input receivable state for a period from performance of the voice input start operation to lapse of the predetermined period T**1**.

Compared with this, the first modified voice dialogue system in Embodiment 2 is an example of configuration in which in the case where a device outputs a voice based on response voice data, the device is in the voice input receivable state for a period from output of the voice to lapse of the predetermined period T**1**, in addition to the above period.

The following explains the details of the first modified voice dialogue system, focusing on different points from the voice dialogue system **100** in Embodiment 1, with reference to the drawings.

<Configuration>

The first modified voice dialogue system is modified from the voice dialogue system **100** in Embodiment 1 so as to include a device **1300** instead of the device **14**.

The device **1300** is not modified from the device **140** in Embodiment 1 in terms of hardware, but is partially modified from the device **140** in terms of software to be stored as an execution target. Accordingly, the device **1300** is modified from the device **140** in Embodiment 1 in terms of part of functions.

FIG. **13** is a block diagram showing functional configuration of the device **1300**.

As shown in the figure, the device **1300** is modified from the device **140** in Embodiment 1 (see FIG. **2**) so as to include a control unit **1310** instead of the control unit **210**.

The control unit **1310** is modified from the control unit **210** in Embodiment 1 so as to have a first modified voice input unit state management function and a second device processing execution function, which are described below, instead of the voice input unit state management function and the first device processing execution function of the control unit **210**.

Similarly to the voice input unit state management function in Embodiment 1, the first modified voice input unit state management function is a function of managing the state of the voice input unit **220**, which is either the voice input receivable state or the voice input unreceivable state, and conditions for switching the state are partially modified from those in the voice input unit state management function in Embodiment 1.

FIG. **14** shows switching of the state managed by the control unit **1310**.

As shown in the figure, in the case where the state is the voice input unreceivable state, (1) the control unit **1310** keeps the state to the voice input unreceivable state until the operation reception unit **230** receives a voice input start operation or the voice output unit **260** outputs a voice included in voices based on response voice data except a predetermined voice. (2) After the reception of the voice input start operation by the operation reception unit **230** or output of the voice included in voices based on the response voice data by the voice output unit **260**, the control unit **1310** switches the state to the voice input receivable state. Then, in the case where the state is the voice input receivable state, (3) the control unit **1310** keeps the state to the voice input receivable state until a predetermined period T**1** (for example, five seconds) has lapsed after the switching of the state to the voice input receivable state. (4) After the lapse of the predetermined period T**1**, the control unit **1310** switches the state to the voice input unreceivable state.

Here, the predetermined voice included in the voices based on response voice data is a voice that indicates unnecessity of a new voice input, such as a voice "This ends dialogue.". Hereinafter, this voice is referred to also as a dialogue end voice.

Note that upon bootup of the device **1300**, the control unit **1310** starts managing the state as the voice input unreceivable state.

Referring back to FIG. **13**, the explanation on the control unit **1310** is continued.

The second device processing execution function is a function performed by the control unit **1310** controlling the voice input unit **220**, the operation reception unit **230**, the communication unit **250**, the voice output unit **260**, the display unit **270**, and the execution unit **280** to cause the device **1300** to execute the second device processing that is its characteristic operation to execute a sequence of processing described below. In the sequence of processing, (1) when the user performs a voice input start operation, (2) the device **1300** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, (5) outputs a voice based on the received response voice data, and (6) in the case where the output voice is not a dialogue end voice, the device **1300** repeats the processing (2) and the subsequent processing even if the user does not perform a voice input start operation.

Note that the second device processing is explained in detail in section <Second Device Processing> later with reference to a flow chart.

The following explains the operation of the first modified voice dialogue system having the above configuration, with reference to the drawings.

<Operation>

The first modified voice dialogue system performs second device processing as its characteristic operation, in addition to the first agent processing in Embodiment 1. The second device processing is partially modified from the first device processing in Embodiment 1.

Explanation is given on the second device processing below, focusing on different points from the first device processing.

<Second Device Processing>

The second device processing is processing performed by the device **1300**. In the second device processing, (1) when the user performs a voice input start operation, (2) the device **1300** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, (5) outputs a voice based on the received response voice data, and (6) in the case where the output voice is not a dialogue end voice, the

device **1300** repeats the processing (2) and the subsequent processing even if the user does not perform a voice input start operation.

FIG. **15** is a flow chart of the second device processing.

Upon bootup of the device **1300**, the second device processing is started.

At a time of bootup of the device **1300**, the state managed by the control unit **1310** is the voice input unreceivable state.

In the figure, processing in Steps S**1500**-S**1580** is the same as the processing in Steps S**600**-S**680** in the first device processing in Embodiment 1 (see FIG. **6**), and is accordingly regarded as having been already explained.

After the end of the processing in Step S**1580**, the control unit **1310** checks whether or not the voice, which is output from the voice output unit **260** in the processing in Step S**1580**, is a dialogue end voice (Step S**1585**). This processing is executed by for example checking whether or not the response text, which is received in the processing in Step S**1560**: Yes, is a predetermined character string (for example, a character string "This ends dialogue.").

In the processing in Step S**1585**, in the case where the response text is not a dialogue end voice (Step S**1585**: No), the control unit **1310** switches the state from the voice input unreceivable state to the voice input receivable state (Step S**1590**), and causes the display unit **270** to display that the state is the voice input receivable state (Step S**1595**).

After the end of the processing in Step S**1595**, the device **1300** returns to the processing in Step S**1530** to perform the processing in Step S**1530** and the subsequent steps.

In the processing in Step S**1585**, in the case where the response text is a dialogue end voice (Step S**1585**: Yes), the device **1300** ends the second device processing.

The following explains a specific example of the operation performed by the first modified voice dialogue system having the above configuration, with reference to the drawing.

<Specific Example>

FIG. **16** is a procedure diagram schematically showing a situation in which the user of the first modified voice dialogue system performs a voice dialogue with the voice dialogue agent **400** with use of the device **1300** (here, assumed to be a smartphone), and the voice dialogue agent **400** performs processing that reflects details of the dialogue.

Here, the explanation is given based on the assumption that a dialogue end voice is a voice "This ends dialogue.".

In the figure, processing in Steps S**1600**-S**1615**, processing in Steps S**1630**-S**1635**, processing in Steps S**1650**-S**1655**, and processing in Steps S**1660**-S**1670** are respectively the same as the processing in Steps S**1000**-S**1015**, the processing in Steps S**1030**-S**1035**, the processing in Steps S**1050**-S**1055**, and the processing in Steps S**1060**-S**1070** in the specific examples in Embodiment 1 (see FIG. **10**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**1615**, since a voice "Which room?" is not a dialogue end voice (corresponding to Step S**1585**: No in FIG. **15**), the state is switched to the voice input receivable state (Step S**1625**, corresponding to Step S**1590** in FIG. **15**). The device **1300** performs first voice input processing (Step S**1630**, corresponding to Step S**1530** in FIG. **15**).

After the end of the processing in Step S**1635**, since a voice "Living room temperature is 28 degrees C. Do you need any other help?" is not a dialogue end voice (corresponding to Step S**1585**: No in FIG. **15**), the state is switched to the voice input receivable state (Step S**1645**, corresponding to Step S**1590** in FIG. **15**). The device **1300** performs first voice input processing (Step S**1650**, corresponding to Step S**1530** in FIG. **15**).

After the end of the processing in Step S**1635**, since a voice "This ends dialogue." is a dialogue end voice (corresponding to Step S**1585**: Yes in FIG. **15**), the state is not switched to the voice input receivable state. The device **1300** ends the second device processing.

<Consideration>

According to the first modified voice dialogue system having the above configuration, in the case where the device **1300** outputs a voice based on response voice data transmitted from the voice dialogue agent **400** and the output voice is not a dialogue end voice, the state of the device **1300** is switched to the voice input receivable state even if the user does not perform a voice input start operation.

Accordingly, once the user performs a voice input start operation with respect to the device **1300**, the user can newly input a voice without newly performing a voice input operation with respect to the device **1300**, for a period from output of the voice based on the response voice data to lapse of the predetermined period T**1** until a dialogue end voice is output.

According to the first modified voice dialogue system, as described above, a further reduced number of operations need to be performed by the user in accordance with a voice input, compared with the voice dialogue system **100** in Embodiment 1.

Embodiment 3

<Outline>

The following explains, as one aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention, a second modified voice dialogue system that is partially modified from the voice dialogue system **100** in Embodiment 1.

The voice dialogue system **100** in Embodiment 1 has been explained as an example of the configuration in which when the user performs a voice input start operation with respect to the device **140**, the device **140** is in the voice input receivable state for a period from performance of the voice input start operation to lapse of the predetermined period T**1**.

Compared with this, the second modified voice dialogue system in Embodiment 3 is an example of configuration in which once a user performs a voice input start operation with respect to a device, the device is in the voice input receivable state for a period from performance of the voice input start operation to output of a dialogue end voice.

The following explains the details of the second modified voice dialogue system, focusing on different points from the voice dialogue system **100** in Embodiment 1, with reference to the drawings.

<Configuration>

The second modified voice dialogue system is modified from the voice dialogue system **100** in Embodiment 1 so as to include a device **1700** instead of the device **140**.

The device **1700** is not modified from the device **140** in Embodiment 1 in terms of hardware, but is partially modified from the device **140** in terms of software to be stored as an execution target. Accordingly, the device **1700** is modified from the device **140** in Embodiment 1 in terms of part of functions.

FIG. **17** is a block diagram showing functional configuration of the device **1700**.

As shown in the figure, the device **1700** is modified from the device **140** in Embodiment 1 (see FIG. **2**) so as to include the control unit **1710** instead of the control unit **210**.

The control unit **1710** is modified from the control unit **210** in Embodiment 1 so as to have a second modified voice input unit state management function and a third device processing execution function, which are described below, instead of the voice input unit state management function and the first device processing execution function of the functions of the control unit **210**, respectively.

Similarly to the voice input unit state management function in Embodiment 1 and the first modified voice input unit state management function in Embodiment 2, the second modified voice input unit state management function is a function of managing the state of the voice input unit **220**, which is either the voice input receivable state or the voice input unreceivable state, and conditions for switching the state are partially modified from those in the voice input unit state management function in Embodiment 1.

FIG. **18** shows switching of the state managed by the control unit **1710**.

As shown in the figure, in the case where the state is the voice input unreceivable state, (1) the control unit **1710** keeps the state to the voice input unreceivable state until the operation reception unit **230** receives a voice input start operation, and (2) after the reception of the voice input start operation by the operation reception unit **230**, the control unit **210** switches the state to the voice input receivable state. Then, in the case where the state is the voice input receivable state, (3) the control unit **1710** keeps the state to the voice input receivable state until the voice output unit **260** outputs a dialogue end voice (for example, a voice "This ends dialogue."), and (4) after the output of the dialogue end voice by the voice output unit **260**, the control unit **1710** switches the state to the voice input unreceivable state.

Referring back to FIG. **17**, the explanation on the control unit **1710** is continued.

The third device processing execution function is a function performed by the control unit **1710** controlling the voice input unit **220**, the operation reception unit **230**, the communication unit **250**, the voice output unit **260**, the display unit **270**, and the execution unit **280** to cause the device **1700** to execute the third device processing, as its characteristic operation, to execute a sequence of processing described below. In the sequence of processing, (1) when the user performs a voice input start operation, (2) the device **1700** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, (5) outputs a voice based on the received response voice data, and (6) in the case where the output voice is not a dialogue end voice, repeats the processing (2) and the subsequent processing even if the user does not perform a voice input start operation.

Note that the third device processing is explained in detail in section <Third Device Processing> later with reference to a flow chart.

The following explains the operation of the second modified voice dialogue system having the above configuration, with reference to the drawings.

<Operation>

The second modified voice dialogue system performs third device processing as its characteristic operation, in addition to the first agent processing in Embodiment 1. The third device processing partially modified from the first device processing in Embodiment 1.

Explanation is given on the third device processing below, focusing on different points from the first device processing.

<Third Device Processing>

The third device processing is processing performed by the device **1700**. In the third device processing, (1) when the user performs a voice input start operation with respect to the device **1700**, (3) the device **1700** receives a voice input from the user, and generates input voice data, (3) transmits the generated input voice data to a voice dialogue agent, (4) receives response voice data returned from the voice dialogue agent, (5) outputs a voice based on the received response voice data, and (6) in the case where the output voice is not a dialogue end voice, repeats the processing (2) and the subsequent processing even if the user does not perform a voice input start operation.

FIG. **19** is a flow chart of the third device processing.

Upon bootup of the device **1700**, the third device processing is started.

At a time of bootup of the device **1700**, the state managed by the control unit **1710** is the voice input unreceivable state.

In the figure, processing in Steps S**1900**-S**1920** and processing in Steps S**1940**-S**1980** is respectively the same as the processing in Steps S**600**-S**620** and the processing in Steps S**640**-S**680** in the first device processing in Embodiment 1 (see FIG. **6**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**1920**, the device **1700** executes second voice input processing (Step S**1930**).

FIG. **20** is a flow chart of the second voice input processing.

When the second voice input processing is started, the voice input unit **220** receives a voice input from a user, and generates input voice data (Step S**2000**).

Then, the control unit **1910** controls the communication unit **250** to transmit the input voice data, which is generated by the voice input unit **220**, to the voice dialogue agent **400** (Step S**2040**).

After the end of the processing in Step S**2040**, the device **1700** ends the second voice input processing.

Referring back to FIG. **19**, the explanation on the third device processing is continued.

After the end of the second voice input processing, the device **1700** proceeds to processing in Step S**1940** to perform the processing in Step S**1940** and processing in subsequent steps.

After the end of the processing in Step S**1980**, the control unit **1710** checks whether or not the voice, which is output from the voice output unit **260** in the processing in Step S**1980**, is a dialogue end voice (Step S**1985**). This processing is executed by for example checking whether or not the response text, which is received in the processing in Step S**1960**: Yes, is a predetermined character string (for example, a character string "This ends dialogue.").

In the processing in Step S**1985**, in the case where the output voice is not a dialogue end voice (Step S**1985**: No), the device **1700** returns to the processing in Step S**1930** to repeat the processing in Step S**1930** and the subsequent steps.

In the processing in Step S**1985**, in the case where the output voice is a dialogue end voice (Step S**1585**: Yes), the control unit **1710** switches the state from the voice input receivable state to the voice input unreceivable state (Step S**1990**).

After the end of the processing in Step S**1990**, the device **1700** ends the third device processing.

The following explains a specific example of the operation performed by the second modified voice dialogue system having the above configuration, with reference to the drawing.

<Specific Example>

FIG. **21** is a procedure diagram schematically showing a situation in which the user of the second modified voice dialogue system performs a voice dialogue with the voice dialogue agent **400** with use of the device **1700** (here, assumed to be a smartphone), and the voice dialogue agent **400** performs processing that reflects the dialogue.

Here, the explanation is given based on the assumption that a dialogue end voice is a voice "This ends dialogue.".

In the figure, processing in Step **S2100**, processing in Step **S2105**, processing in Step **S2115**, processing in Step **S2135**, processing in Step **S2155**, and processing in Steps **S2160**-**S2170** are respectively the same as the processing in Step **S1000**, the processing in Step **S1005**, the processing in Step **S1015**, the processing in Step **S1035**, the processing in Step **S1055**, and the processing in Steps **S1060**-**S1070** in the specific examples in Embodiment 1 (see FIG. **10**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step **S2105**, the device **1700** performs second voice input processing (Step **S2110**, corresponding to Step **S1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "What is room temperature?", the device **1700** transmits input voice data "What is room temperature?" to the voice dialogue agent **400** (corresponding to Step **S2040** in FIG. **20**).

After the end of the processing in Step **S2115**, since the voice "Which room?" is not a dialogue end voice (corresponding to Step **S1985**: No in FIG. **19**), the device **1700** performs second voice input processing (Step **S2130**, corresponding to Step **S1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "Living room.", the device **1700** transmits input voice data "Living room." to the voice dialogue agent **400** (corresponding to Step **S2040** in FIG. **20**).

After the end of the processing in Step **S2135**, since the voice "Living room temperature is 28 degrees C. Do you need any other help?" is not a dialogue end voice (corresponding to Step **S1985**: No in FIG. **19**), the device **1700** performs second voice input processing (Step **S2150**, corresponding to Step **S1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "No. Thank you.", the device **1700** transmits input voice data "No. Thank you." to the voice dialogue agent **400** (corresponding to Step **S2040** in FIG. **20**).

After the end of the processing in Step **S2135**, since a voice "This ends dialogue." is a dialogue end voice (corresponding to Step **S1585**: Yes in FIG. **19**), the state is switched to the voice input receivable state (corresponding to Step **S1990** in FIG. **19**). The device **1700** ends the third device processing.

<Consideration>

According to the second modified voice dialogue system having the above configuration, once voice input start operation is performed, the device **1700** keeps in the voice input receivable state for a period from performance of the voice input start operation to output of a dialogue end voice.

Accordingly, once the user performs a voice input start operation with respect to the device **1700**, the user can newly input a voice without newly performing a voice input operation with respect to the device **1700** until a dialogue end voice is output.

According to the second modified voice dialogue system, as described above, a further reduced number of operations need to be performed by the user in accordance with a voice input, compared with the voice dialogue system **100** in Embodiment 1.

Embodiment 4

<Outline>

The following explains, as one aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention, a third modified voice dialogue system that is partially modified from the second modified voice dialogue system in Embodiment 3.

The second modified voice dialogue system in Embodiment 3 has been explained as an example of the configuration in which once the device **1700** starts communication with a voice dialogue agent A, a voice dialogue agent as a communication party is limited to the voice dialogue agent A until a series of processing ends.

Compared with this, the third modified voice dialogue system in Embodiment 4 is an example of configuration in which in the case where a device starts communication with a voice dialogue agent A and a user of the third modified voice dialogue system inputs, with use of the device, a voice indicating that the user hopes to communicate with another voice dialogue agent B, a communication party of the device is changed from the voice dialogue agent A to the voice dialogue agent B.

The following explains the details of the third modified voice dialogue system, focusing on different points from the second modified voice dialogue system in Embodiment 3, with reference to the drawings.

<Configuration>

The third modified voice dialogue system is modified from the second voice dialogue system in Embodiment 3 so as to include a voice dialogue agent **2200** instead of the voice dialogue agent **400**.

Similarly to the voice dialogue agent **400** in Embodiment 3, the voice dialogue agent **2200** is embodied by the voice dialogue agent server **110**.

Software for embodying the voice dialogue agent **2200**, which is executed by the voice dialogue agent server **110**, is partially modified from the software for embodying the voice dialogue agent **400** in Embodiment 3. Accordingly, the voice dialogue agent **2200** is modified from the voice dialogue agent **400** in Embodiment 3 in terms of part of functions.

FIG. **22** is a block diagram showing functional configuration of the voice dialogue agent **2200**.

As shown in the figure, the voice dialogue agent **2200** is modified from the voice dialogue agent **400** in Embodiment 3 (see FIG. **4**) so as to additionally include a target agent DB storage unit **2220** and include a control unit **2210** instead of the control unit **410**.

The target agent DB storage unit **2220** is for example embodied by a memory and a processor that executes programs. The target agent DB storage unit **2220** is connected to the control unit **2210**, and has a function of storing therein a target agent DB **2300**.

FIG. **23** is a data structure diagram showing the target agent DB **2300** stored in the target agent DB storage unit **2220**.

As shown in the figure, the target agent DB **2300** includes keyword **2310**, target agent **2320**, and IP address **2330** that are associated with each other.

The keyword **2310** indicates a character string that is assumed to be included in an input text converted by the voice recognition processing unit **430**.

The target agent **2320** is information for specifying, as a communication party of the device **140**, one of a plurality of voice dialogue agents **2200**. Hereinafter, this one of the voice dialogue agents **2200** is referred to as an additional voice dialogue agent.

In this example, the additional voice dialogue agent specified by the target agent **2320** is a car agent, a retailer agent, or a home agent.

Here, the car agent indicates one of voice dialogue agents **2200** that provides a relatively satisfactory service relating to devices in mounted in a car. The retailer agent indicates one of voice dialogue agents **2200** that provides a relatively satisfactory service relating to devices in mounted in a retailer. The home agent indicates one of voice dialogue agents **2200** that provides a relatively satisfactory service relating to devices in mounted in a residence (home).

The IP address **2330** indicates an IP address in the network **120** relating to the voice dialogue agent server **110** that embodies an additional voice dialogue agent specified by the associated target agent **2320**.

As shown in FIG. **23**, each of the additional voice dialogue agents specified by the target agent **2320** is associated with one or more character strings indicated by the keyword **2310**. For example, the car agent is associated with character strings indicated by the keyword **2310**, such as character strings "in-car", "car", "vehicle", and "navigation system".

Since each of the additional voice dialogue agents, which is specified by the target agent **2320**, is associated with one or more character strings, which are indicated by the keyword **2310**, the voice dialogue agent **2200** can respond an ambiguous input.

For example, in the case where the user hopes to communicate with the car agent, the user sometimes inputs a voice "Connect to voice dialogue agent of navigation system.", and sometimes inputs a voice "Connect to voice dialogue agent of car.".

Here, the character strings indicated by the keyword **2310** "navigation system" and "car" are each associated with the car agent. Accordingly, both in the case where a voice "navigation system" is input and in the case where a voice "car" is input, it is possible to specify the car agent as the additional voice dialogue agent **2200**, which is specified by the target agent **2320**, by referring to the target agent DB **2300**.

Referring back to FIG. **22**, the explanation on the voice dialogue agent **2200** is continued.

The control unit **2210** is modified from the control unit **410** in Embodiment 3 so as to have a second agent processing execution function and a third agent processing execution function, which are described below, instead of the first agent processing execution function of the control unit **410**.

The second agent processing execution function is a function performed by the control unit **2210** controlling the communication unit **420**, the voice recognition processing unit **430**, the voice synthesizing processing unit **450**, and the instruction generation unit **460** to cause the voice dialogue agent **2200** to execute second agent processing as its characteristic operation to execute a sequence of processing described below. In the sequence of processing, (1) the voice dialogue agent **2200** receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) in the case where the generated input text indicates that the user hopes to communicate with another voice dialogue agent, establishes communication between the device and the other voice dialogue agent, (4) otherwise, generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruction set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

Note that the second agent processing is explained in detail in section <Second Agent Processing> later with reference to a flow chart.

The third agent processing execution function is a function performed by the control unit **2210** controlling the communication unit **420**, the voice recognition processing unit **430**, the voice synthesizing processing unit **450**, and the instruction generation unit **460** to cause the voice dialogue agent **2200** to execute third agent processing as its characteristic operation to execute a sequence of processing described below. In the sequence of processing, (1) the voice dialogue agent **2200** starts communication with a device in response to a request from another voice dialogue agent, (2) receives input voice data transmitted from the device, (3) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text, (4) generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruction set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

Note that the third agent processing is explained in detail in section <Third Agent Processing> later with reference to a flow chart.

The following explains the operation of the third modified voice dialogue system having the above configuration, with reference to the drawings.

<Operation>

The third modified voice dialogue system performs second agent processing and third agent processing as its characteristic operation, in addition to the first agent processing in Embodiment 1. The second agent processing and the third agent processing is partially modified from the first agent processing in Embodiment 3.

Explanation is given on the second agent processing and the third agent processing below, focusing on different points from the first agent processing.

<Second Agent Processing>

The second agent processing is processing performed by the voice dialogue agent **2200**. In the second agent processing, (1) the voice dialogue agent **2200** receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) in the case where the generated input text indicates that the user hopes to communicate with another voice dialogue agent, establishes communication between the device and the other voice dialogue agent, (4) otherwise, generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruc-

tion set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

FIG. **24** is a flow chart of the second agent processing.

Upon bootup of the voice dialogue agent **2200**, the second agent processing is started.

When the second agent processing is started, the voice dialogue agent **2200** stands by until the communication unit **420** receives input voice data transmitted from the device **1700** (Step S**2400**: Repetition of No). When the communication unit **420** receives the input voice data (Step S**2400**: Yes), the voice dialogue agent **2200** performs second instruction execution processing (Step S**2410**).

FIG. **25** is a flow chart of the second instruction execution processing.

In the figure, processing in Steps S**2500**-S**2510** and processing in Steps S**2520**-S**2560** is respectively the same as the processing in Steps S**900**-S**910** and the processing in Steps S**920**-S**960** in the first instruction execution processing in Embodiment 3 (see FIG. **9**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**2510**, the control unit **2210** checks whether or not the input text, which is converted by the voice recognition processing unit **430**, requests to communicate with another voice dialogue agent (Step S**2515**).

In the processing in Step S**2515**, in the case where the input text does not request communication with another voice dialogue agent (Step S**2515**: No), the voice dialogue agent **2200** proceeds to the processing in Step S**2520** to perform the processing in Steps S**2520**-S**2560**.

In the processing in Step S**2515**, in the case where the input text requests to communicate with another voice dialogue agent (Step S**2515**: Yes), the control unit **2210** specifies a voice dialogue agent **2200** that is requested as a communication party, with reference to the target agent DB **2300** stored in the target agent DB storage unit **2220** (Step S**2517**). In other words, the control unit **2210** specifies, as the voice dialogue agent **2200** requested as a communication party, an additional voice dialogue agent that is specified by the target agent **2320** associated with a character string that is indicated by the keyword **2310** included in the input text, which is converted by the voice recognition processing unit **430**.

After the specification of the additional voice dialogue agent requested as a communication party, the control unit **2210** generates a predetermined signal indicating to start communication between the specified additional voice dialogue agent and the device **1700** which has transmitted the input voice data (Step S**2565**). Hereinafter, this signal is referred to as a connection instruction.

After the generation of the connection instruction, the control unit **2210** controls the communication unit **420** to transmit the generated connection instruction to the additional voice dialogue agent, with use of an IP address indicated by the IP address **2330** which is associated with the character string indicate by the keyword **2310** (Step S**2570**).

Then, the control unit **2210** stands by until the communication unit **420** receives a connection response (described later) that is returned from the additional voice dialogue agent in response to the connection instruction that is transmitted in the processing in Step S**2570** (Step S**2575**: Repetition of No).

When the connection response is received by the communication unit **420** (Step S**2575**: Yes), the voice dialogue agent **2200** executes first connection response processing (Step S**2580**).

FIG. **26** is a flow chart of the first connection response processing.

When the first connection response processing is started, the control unit **2210** generates a predetermined response text indicating that communication becomes available between the additional voice dialogue agent and the device **1700** (Step S**2600**). The predetermined response text is for example a character string "Connection to [Additional voice dialogue agent] has been established.".

Here, in part [Additional voice dialogue agent] in the character string, a name of the voice dialogue agent **2200** (here, either of the car agent, the retailer agent, or the home agent), which is specified by the target agent **2320** included in the target agent DB **2300**, is inserted.

After the generation of the response text, the voice synthesizing processing unit **450** performs voice synthesizing processing on the generated response text to generate response voice data (Step S**2610**).

After the generation of the response voice data, the control unit **2210** controls the communication unit **420** to transmit the generated response text and response voice data to the device **1700** which has transmitted the input voice data (Step S**2620**).

After the end of the processing in Step S**2620**, the voice dialogue agent **2200** ends the first connection response processing.

Referring back to FIG. **25**, the explanation on the second instruction execution processing is continued.

After the end of the first connection response processing, the voice dialogue agent **2200** stands by until the communication unit **420** receives a disconnection response (described later) that is transmitted from the additional voice dialogue agent (Step S**2585**: Repetition of No).

When the communication unit **420** receives the disconnection response (Step S**2585**: Yes), the voice dialogue agent **2200** executes disconnection response processing (Step S**2590**).

FIG. **27** is a flow chart of the disconnection response processing.

When the disconnection response processing is started, the control unit **2210** generates a predetermined response text indicating that the communication ends between the additional voice dialogue agent and the device **1700** (Step S**2700**). The predetermined response text is for example a character string "Connection to [Additional voice dialogue agent] has been terminated. Do you need any other help?".

Here, in part [Additional voice dialogue agent] in the character string, a name of the voice dialogue agent **2200** (here, either of the car agent, the retailer agent, or the home agent), which is specified by the target agent **2320** included in the target agent DB **2300**, is inserted.

After the generation of the response text, the voice synthesizing processing unit **450** performs voice synthesizing processing on the generated response text to generate response voice data (Step S**2710**).

After the generation of the response voice data, the control unit **2210** controls the communication unit **420** to transmit the generated response text and response voice data to the device **1700** which has transmitted the input voice data (Step S**2720**).

After the end of the processing in Step S**2720**, the voice dialogue agent **2200** ends the disconnection response processing.

Referring back to FIG. **25** again, the explanation on the second instruction execution processing is continued.

After the end of the disconnection response processing, or after the end of the processing in Step S**2560**, the voice dialogue agent **2200** ends the second instruction execution processing.

Referring back to FIG. **24**, the explanation on the second agent processing is continued.

After the end of the second instruction execution processing, the voice dialogue agent **2200** returns to the processing in Step S**2400** to perform the processing in Step S**2400** and the subsequent steps.

<Third Agent Processing>

The third agent processing is processing performed by the voice dialogue agent **2200**. In the third agent processing, (1) the voice dialogue agent 2200 starts communication with a device in response to a request from another voice dialogue agent, (2) receives input voice data transmitted from the device, (3) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text, (4) generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruction set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

FIG. **28** is a flow chart of the third agent processing.

In the figure, processing in Steps S**2800**-S**2810** and processing in Steps S**2820**-S**2860** is respectively the same as the processing in Steps S**900**-S**910** and the processing in Steps S**920**-S**960** in the first instruction execution processing in Embodiment 1 (see FIG. **9**). Accordingly, the processing in the figure is regarded as having been already explained.

Upon bootup of the voice dialogue agent **2200**, the third agent processing is started.

When the third agent processing is started, the voice dialogue agent **2200** stands by until the communication unit **420** receives a connection instruction transmitted from another voice dialogue agent (Step S**2811**: Repetition of No). When the communication unit **420** receives the connection instruction (Step S**2811**: Yes), the control unit **2210** controls the communication unit **420** to execute connection processing of starting communication with the device **1700** that is a communication party requested by the connection instruction.

Here, the connection processing includes processing of changing a transmission destination of input voice data to be transmitted from the device **1700** from the voice dialogue agent **2200**, which has transmitted the connection instruction, to the voice dialogue agent **2200**, which has received the connection instruction.

After the execution of the connection processing, the control unit **2210** controls the communication unit **420** to generate a connection response that is a signal indicating that communication with the device **1700** has started, and transmits the generated connection response to the voice dialogue agent which has transmitted the connection instruction (Step S**2813**).

Then, the control unit **2210** stands by until the communication unit **420** receives the input voice data transmitted from the device **1700** (Step S**2814**: Repetition of No). When the communication unit **420** receives the input voice data (Step S**2814**: Yes), the control unit **2210** performs the processing in Steps S**2800**-S**2810**.

After the end of the processing in Step S**2810**, the control unit **2210** checks whether or not the input text, which is converted by the voice recognition processing unit **430**, requests to terminate communication with the voice dialogue agent **2200** (Step S**2815**).

In the processing in Step S**2815**, in the case where the input text does not indicate to terminate the communication with the voice dialogue agent **2200** (Step S**2815**: No), the voice dialogue agent **2200** proceeds to the processing in Step S**2820** to perform the processing in Steps S**2820**-S**2860**. After the end of the processing in Step S**2860**, the voice dialogue agent **2200** returns to the processing in Step S**2814** to perform the processing in Step S**2814** and the subsequent steps.

In the processing in Step S**2815**, in the case where the input text indicates to terminate the communication with the voice dialogue agent **2200** (Step S**2815**: Yes), the control unit **2210** controls the communication unit **420** to execute disconnection processing of terminating the communication with the device **1700**.

Here, the disconnection processing includes processing of changing the transmission destination of input voice data to be transmitted from the device **1700** from the voice dialogue agent **2200**, which has received the connection instruction, to the voice dialogue agent **2200**, which has transmitted the connection instruction.

After the execution of the disconnection processing, the control unit **2210** controls the communication unit **420** to generate a disconnection response that is a predetermined signal indicating that the communication with the device **1700** has been terminated, and transmits the generated disconnection response to the voice dialogue agent which has transmitted the connection instruction (Step S**2890**).

After the end of the processing in Step S**2890**, the voice dialogue agent **2200** returns to the processing in Step S**2811** to perform the processing in Step S**2811** and the subsequent steps.

The following explains a specific example of the operation performed by the third modified voice dialogue system having the above configuration, with reference to the drawing.

<Specific Example>

FIG. **29** is a procedure diagram schematically showing a situation in which the user of the third modified voice dialogue system starts, with use of the device **1700**, a voice dialogue with a home agent, which is one of the voice dialogue agents **2200**, and then starts communication with the car agent, which is one of the voice dialogue agents **2200**, in response to a connection instruction generated by the home agent, and performs a dialogue with the car agent.

Here, the explanation is given based on the assumption that a specific voice dialogue agent server for the device **1700** used by the user is the voice dialogue agent server **110** that embodies the home agent, and a dialogue end voice is a voice "This ends dialogue.".

In the figure, processing in Steps S**2900**-S**2905** is respectively the same as the processing in Steps S**2100**-S**2105** in the specific example in Embodiment 3 (see FIG. **21**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**2905**, the device **1700** performs second voice input processing (Step S**2906**, corresponding to Step S**1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "Connect to car agent.", the device **1700** transmits input voice data "Connect to car agent." to the home agent (corresponding to Step S**2040** in FIG. **20**).

Then, the home agent receives the input voice data (corresponding to Step S2400: Yes in FIG. 24), and performs second instruction execution processing (corresponding to Step S2410 in FIG. 24).

In the second instruction execution processing, since the input text requests to communicate with the car agent (corresponding to Step S2515: Yes in FIG. 25), the home agent transmits a connection instruction to the car agent (corresponding to Step S2570 in FIG. 25).

Then, the car agent receives the connection instruction (corresponding to Step S2811: Yes in FIG. 28), and starts communication with the device 1700 (corresponding to Step S2812 in FIG. 28), and transmits a connection response to the home agent (Step S2990, corresponding to Step S2813 in FIG. 28).

The home agent receives the connection response (corresponding to Step S2575: Yes in FIG. 25), and performs first connection response processing (Step S2965, corresponding to Step S2580 in FIG. 25).

Here, in the first connection response processing, in the case where the voice dialogue agent 2200 generates response voice data "Connection to car agent has been established.", the voice dialogue agent 2200 transmits response voice data "Connection to car agent has been established." to the device 1700 (corresponding to Step S2620 in FIG. 26).

Then, the device 1700 receives the response voice data (corresponding to Step S1960: Yes in FIG. 19), and outputs a voice "Connection to car agent has been established." (Step S2907, corresponding to Step S1980 in FIG. 19).

Since the voice "Connection to car agent has been established." is not a dialogue end voice (corresponding to Step S1985: No in FIG. 19), the device 1700 performs second voice input processing (Step S2910, corresponding to Step S1930 in FIG. 19).

In the second voice input processing, in the case where the user inputs a voice "What is temperature in car?", the device 1700 transmits input voice data "What is temperature in car?" to the car agent (corresponding to Step S2040 in FIG. 20).

Then, the car agent receives the input voice data (corresponding to Step S2814: Yes in FIG. 28). Since the input voice data does not request to terminate the communication (corresponding to Step S2815: No in FIG. 28), the car agent generates an instruction set corresponding to the input voice data, and executes the generated instruction set (Step S2994, corresponding to Step S2830 in FIG. 28).

Here, in execution of the instruction set, in the case where the car agent generates response voice data "Temperature in car is 38 degrees C. Do you need any other help?", the car agent transmits the response voice data "Temperature in car is 38 degrees C. Do you need any other help?" to the device 1700 (corresponding to Step S2860: Yes in FIG. 28).

Then, the device 1700 receives the response voice data (corresponding to Step S1960: Yes in FIG. 19), and outputs a voice "Temperature in car is 38 degrees C. Do you need any other help?" (Step S2915, corresponding to Step S1980 in FIG. 19).

Since the voice "Temperature in car is 38 degrees C. Do you need any other help?" is not a dialogue end voice (corresponding to Step S1985: No in FIG. 19), the device 1700 performs second voice input processing (Step S2930, corresponding to Step S1930 in FIG. 19).

In the second voice input processing, in the case where the user inputs a voice "No. Thank you.", the device 1700 transmits input voice data "No. Thank you." to the car agent (corresponding to Step S2040 in FIG. 20).

Then, the car agent receives the input voice data (corresponding to Step S2814: Yes in FIG. 28). Since the input voice data requests to terminate the communication (corresponding to Step S2815: Yes in FIG. 28), the car agent terminates the communication with the device 1700 (corresponding to Step S2870 in FIG. 28), and transmits a disconnection response to the home agent (Step S2998, corresponding to Step S2890 in FIG. 28).

Then, the home agent receives the disconnection response (corresponding to Step S2585: Yes in FIG. 25), and performs disconnection response processing (Step S2970, corresponding to Step S2890 in FIG. 25).

Here, in the disconnection processing, in the case where the voice dialogue agent 2200 generates response voice data "Connection to car agent has been terminated. Do you need any other help?", the voice dialogue agent 2200 transmits the response voice data "Connection to car agent has been terminated. Do you need any other help?" to the device 1700 (corresponding to Step S2720 in FIG. 27).

Then, the device 1700 receives the response voice data (corresponding to Step S1960: Yes in FIG. 19), and outputs a voice "Connection to car agent has been terminated. Do you need any other help?" (Step S2935, corresponding to Step S1980 in FIG. 19).

Since the voice "Connection to car agent has been terminated. Do you need any other help?" is not a dialogue end voice (corresponding to Step S1985: No in FIG. 19), the device 1700 performs second voice input processing (Step S2950, corresponding to Step S1930 in FIG. 19).

In the second voice input processing, in the case where the user inputs a voice "No. Thank you.", the device 1700 transmits input voice data "No. Thank you." to the home agent (corresponding to Step S2040 in FIG. 20).

Then, the home agent receives the input voice data (corresponding to Step S2800: Yes in FIG. 24), and performs second instruction execution processing (Step S2975, corresponding to Step S2410 in FIG. 24).

Here, in the second instruction execution processing, in the case where the home agent generates response voice data "This ends dialogue.", the home agent transmits the response voice data "This ends dialogue." to the device 1700 (corresponding to Step S2560 in FIG. 25).

Then, the device 1700 receives the response voice data (corresponding to Step S1960: Yes in FIG. 19), and outputs a voice "This ends dialogue." (Step S2955, corresponding to Step S1980 in FIG. 19).

Since the voice "This ends dialogue." is a dialogue end voice (corresponding to Step S1585: Yes in FIG. 19), the state is switched to the voice input receivable state (corresponding to Step S1990 in FIG. 19). The device 1700 ends the third device processing.

<Consideration>

According to the third modified voice dialogue system having the above configuration, in the case where the user of the third modified voice dialogue system, who is communicating with the voice dialogue agent A, hopes to cause the voice dialogue agent B rather than the voice dialogue agent A to perform processing, it is possible to change the voice dialogue agent that is appropriate for performing the processing via communication from the voice dialogue agent A to the voice dialogue agent B to cause the voice dialogue agent B to perform desired processing.

Also, in this case, since the voice dialogue agent A transfers input voice data that is not modified to the voice dialogue agent B, the voice dialogue agent B performs voice

recognition processing on the input voice data. As a result, the user can receive a more appropriate service from the voice dialogue agent B.

Embodiment 5

<Outline>

The following explains, as one aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention, a fourth modified voice dialogue system that is partially modified from the third modified voice dialogue system in Embodiment 4.

The third modified voice dialogue system in Embodiment 4 has been explained as an example of the configuration in which in the case where a device starts communication with the voice dialogue agent A and the user of the third modified voice dialogue system inputs, with use of the device, a voice indicating that the user hopes to communicate with another voice dialogue agent B, a communication party of the device is changed from the voice dialogue agent A to the voice dialogue agent B.

Compared with this, the fourth modified voice dialogue system in Embodiment 5 is an example of configuration in which in the case where a device starts communication with a voice dialogue agent A and predetermined condition is satisfied for the communication, the voice dialogue agent A determines that the voice dialogue agent B rather than the voice dialogue agent A is appropriate as a communication party, and a communication party of the device is changed from the voice dialogue agent A to the voice dialogue agent B.

The following explains the details of the fourth modified voice dialogue system, focusing on different points from the third modified voice dialogue system in Embodiment 4, with reference to the drawings.

<Configuration>

The fourth modified voice dialogue system is modified from the third voice dialogue system in Embodiment 4 so as to include a voice dialogue agent **3000** instead of the voice dialogue agent **2200**.

Similarly to the voice dialogue agent **2200** in Embodiment 4, the voice dialogue agent **3000** is embodied by the voice dialogue agent server **110**.

Software for embodying the voice dialogue agent **3000**, which is executed by the voice dialogue agent server **110**, is partially modified from the software for embodying the voice dialogue agent **2200** in Embodiment 3. Accordingly, the voice dialogue agent **3000** is modified from the voice dialogue agent **2200** in Embodiment 4 in terms of part of functions.

FIG. **30** is a block diagram showing functional configuration of the voice dialogue agent **3000**.

As shown in the figure, the voice dialogue agent **3000** is modified from the voice dialogue agent **2200** in Embodiment 4 (see FIG. **22**) so as not to include the target agent DB storage unit **2220**, and so as to additionally include an available service DB storage unit **3020** and include a control unit **3010** instead of the control unit **2210**.

The available service DB storage unit **3020** is for example embodied by a memory and a processor that executes programs. The available service DB storage unit **3020** is connected to the control unit **3010**, and has a function of storing therein an available service DB **3100**.

FIG. **31** is a data structure diagram showing the available service DB **3100** stored in the available service DB storage unit **3020**.

As shown in the figure, the available service DB **3100** includes keyword **3110**, target agent **3120**, processing details **3130**, IP address **3140**, and availability **3150** that are associated with each other.

The keyword **3110** indicates a character string that is assumed to be included in an input text converted by the voice recognition processing unit **430**.

The target agent **3120** is information for specifying an additional voice dialogue agent as a communication party of the device **1700**.

In this example, the additional voice dialogue agents specified by the target agent **2320** include the car agent, the retailer agent, and the home agent, similarly to Embodiment 4.

The processing details **3130** are information for specifying, in the case where a character string indicated by the associated keyword **3110** is included in an input text that is converted by the voice recognition processing unit **430**, processing that is determined to be executed by a device that is specified by the associated target device **3120**.

The IP address **3140** indicates an IP address in the network **120** relating to the voice dialogue agent server **110** that embodies the additional voice dialogue agent specified by the associated target agent **3120**.

The availability **3150** is information for specifying whether or not the voice dialogue agent can perform processing specified by the associated processing details **3130**.

Referring back to FIG. **30**, the explanation on the voice dialogue agent **3000** is continued.

The control unit **3010** is modified from the control unit **2210** in Embodiment 4 so as to have a fourth agent processing execution function, which is described below, instead of the second agent processing execution function of the control unit **2210**.

The fourth agent processing execution function is a function performed by the control unit **3010** controlling the communication unit **420**, the voice recognition processing unit **430**, the voice synthesizing processing unit **450**, and the instruction generation unit **460** to control the voice dialogue agent **3000** to execute the fourth agent processing, which is its characteristic operation, to execute a sequence of processing described below. In the sequence of processing, (1) the voice dialogue agent **3000** receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) in the case where the generated input text includes a predetermined keyword, establishes communication between the device and a target agent associated with the predetermined keyword, (4) otherwise, generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruction set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

Note that the fourth agent processing is explained in detail in section <Fourth Agent Processing> later with reference to a flow chart.

The following explains the operation of the fourth modified voice dialogue system having the above configuration, with reference to the drawings.

<Operation>

The fourth modified voice dialogue system performs fourth agent processing as its characteristic operation, in addition to the second device processing and the third agent

processing in Embodiment 4. The fourth agent processing is partially modified from the second agent processing in Embodiment 3.

Explanation is given on the fourth agent processing below, focusing on different points from the second agent processing.

<Fourth Agent Processing>

The fourth agent processing is processing performed by the voice dialogue agent **3000**. In the fourth agent processing, (1) the voice dialogue agent **3000** receives input voice data transmitted from a device, (2) performs voice recognition processing on the received input voice data to generate an input text, and returns the generated input text to the device, (3) in the case where the generated input text includes a predetermined keyword, establishes communication between the device and a target agent associated with the predetermined keyword, (4) otherwise, generates an instruction set based on the generated input text, and executes the generated instruction set, (5) generates a response text based on an execution result of the instruction set, (6) converts the generated response text to response voice data, and (7) returns the response text and the response voice data to the device.

FIG. **32** is a flow chart of the fourth agent processing.

Upon bootup of the voice dialogue agent **3000**, the fourth agent processing is started.

When the fourth agent processing is started, the voice dialogue agent **3000** stands by until the communication unit **420** receives input voice data transmitted from the device **1700** (Step S**3200**: Repetition of No). When the communication unit **430** receives the input voice data (Step S**3200**: Yes), the voice dialogue agent **3000** performs second instruction execution processing (Step S**3210**).

FIG. **33** is a flow chart of the third instruction execution processing.

In the figure, processing in Steps S**3300**-S**3310**, processing in Steps S**3320**-S**3360**, processing in Steps S**3365**-S**3375**, and processing in Steps S**3385**-S**3390** are respectively the same as the processing in Steps S**2500**-S**2510**, the processing in Steps S**2520**-S**2560**, the processing in Steps S**2565**-S**2575**, and the processing in Steps S**2585**-S**2590** in Embodiment 4. Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**3310**, the control unit **3010** refers to the available service DB **3100** stored in the available service DB storage unit **3020** (Step S**3312**) to determine whether or not another voice dialogue agent is appropriate for performing processing corresponding to the input text data (Step S**3315**). In other words, in the case where the input text data includes a character string indicated by the keyword **3110** and an additional voice dialogue agent specified by the target agent **3120** associated with the keyword **3110** is not the voice dialogue agent **3000** which is currently performing the third instruction execution processing, the control unit **3010** determines that the other voice dialogue agent (another additional voice dialogue agent specified by the target agent **3120**) is appropriate for performing the processing. Otherwise, the control unit **3010** determines that the other voice dialogue agent is not appropriate for performing the processing.

In the processing in Step S**3315**, in the case where the control unit **3010** determines that the other voice dialogue agent is not appropriate for performing the processing (Step S**3315**: No), the voice dialogue agent **3000** proceeds to the processing in Step S**3320** to perform the processing in Steps S**3320**-S**3360**.

In the processing in Step S**3315**, in the case where the control unit **3010** determines that the other voice dialogue agent is appropriate for performing the processing (Step S**3315**: Yes), the voice dialogue agent **3000** proceeds to the processing in Step S**3365** to perform the processing in Steps S**3365**-S**3375**.

In the processing in Step S**3375**, when the communication unit **420** receives the connection response returned from the additional voice dialogue agent (Step S**3375**: Yes), the voice dialogue agent **3000** performs second connection response processing (Step S**3380**).

FIG. **34** is a flow chart of the second connection response processing.

When the second connection response processing is started, the control unit **3010** controls the communication unit **420** to transfer the input voice data, which is received in the processing in Step S**3200**: Yes, to the additional voice dialogue agent, which is specified by the processing in Step S**3315**: Yes (Step S**3400**).

After the end of the processing in Step S**3400**, the voice dialogue agent **3000** ends the second connection response processing.

Referring back to FIG. **33**, the explanation on the second instruction execution processing is continued.

After the end of the second connection response processing, the voice dialogue agent **3000** proceeds to Step S**3385** to perform the processing in Steps S**3385**-S**3390**.

After the end of the processing in Step S**3390**, or after the end of the processing in Step S**3360**, the voice dialogue agent **3000** ends the third instruction execution processing.

Referring back to FIG. **32**, the explanation on the fourth agent processing is continued.

After the end of the third instruction execution processing, the voice dialogue agent **3000** returns to the processing in Step S**3200** to perform the processing in Step S**3200** and the subsequent steps.

The following explains a specific example of the operation performed by the fourth modified voice dialogue system having the above configuration, with reference to the drawing.

<Specific Example>

FIG. **35** is a procedure diagram schematically showing a situation in which the user of the fourth modified voice dialogue system starts, with use of the device **1700**, a voice dialogue with the home agent, which is one of the voice dialogue agents **3000**, and then starts communication with the car agent in response to a connection instruction generated by the home agent, and performs a dialogue with the car agent.

Here, the explanation is given based on the assumption that a specific voice dialogue agent server for the device **1700** used by the user is the voice dialogue agent server **110** that embodies the home agent, and a dialogue end voice is a voice "This ends dialogue.".

In the figure, processing in Steps S**3500**-S**3505** is respectively the same as the processing in Steps S**2900**-S**2905** in the specific example in Embodiment 4 (see FIG. **29**). Accordingly, the processing in the figure is regarded as having been already explained.

After the end of the processing in Step S**3505**, the device **1700** performs second voice input processing (Step S**3506**, corresponding to Step S**1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "What is temperature in car?", the device **1700** transmits input voice data "What is temperature in car?" to the home agent (corresponding to Step S**2040** in FIG. **20**).

Then, the home agent receives the input voice data (corresponding to Step S**3200**: Yes in FIG. **32**), and performs third instruction execution processing (corresponding to Step S**3210** in FIG. **32**).

In the third instruction execution processing, since the input text includes keywords "temperature" and "in-car" and an additional voice dialogue agent specified by the target agent **3120** is not the home agent (corresponding to Step S**3315**: No in FIG. **33**), the home agent transmits a connection instruction to the car agent (corresponding to Step S**3370** in FIG. **33**).

Then, the car agent receives the connection instruction (corresponding to Step S**2811**: Yes in FIG. **28**), and starts communication with the device **1700** (corresponding to Step S**2812** in FIG. **28**), and transmits a connection response to the home agent (Step S**3590**, corresponding to Step S**2813** in FIG. **28**).

The home agent receives the connection response (corresponding to Step S**3375**: Yes in FIG. **33**), and performs second connection response processing (corresponding to Step S**3380** in FIG. **33**).

In the second connection response processing, the home agent transmits input voice data "What is temperature in car?" to the car agent (corresponding to Step S**3400** in FIG. **34**).

Then, the car agent receives the input voice data (corresponding to Step S**2814**: Yes in FIG. **28**). Since the input voice data does not request to terminate the communication (corresponding to Step S**2815**: No in FIG. **28**), the car agent generates an instruction set corresponding to the input voice data, and executes the generated instruction set (Step S**3594**, corresponding to Step S**2830** in FIG. **28**).

Here, in execution of the instruction set, in the case where the car agent generates response voice data "Temperature in car is 38 degrees C. Do you need any other help?", the car agent transmits the response voice data "Temperature in car is 38 degrees C. Do you need any other help?" to the device **1700** (corresponding to Step S**2860**: Yes in FIG. **28**).

Then, the device **1700** receives the response voice data (corresponding to Step S**1960**: Yes in FIG. **19**), and outputs a voice "Temperature in car is 38 degrees C. Do you need any other help?" (Step S**3507**, corresponding to Step S**1980** in FIG. **19**).

Since the voice "Temperature in car is 38 degrees C. Do you need any other help?" is not a dialogue end voice (corresponding to Step S**1985**: No in FIG. **19**), the device **1700** performs second voice input processing (Step S**3510**, corresponding to Step S**1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "Turn on air conditioner with 25 degrees C. of temperature setting.", the device **1700** transmits input voice data "Turn on air conditioner with 25 degrees C. of temperature setting." to the car agent (corresponding to Step S**2040** in FIG. **20**).

Then, the car agent receives the input voice data (corresponding to Step S**2814**: Yes in FIG. **28**). Since the input voice data does not request to terminate the communication (corresponding to Step S**2815**: No in FIG. **28**), the car agent generates an instruction set corresponding to the input voice data, and executes the generated instruction set (Step S**3594**, corresponding to Step S**2830** in FIG. **28**).

Here, in execution of the instruction set, in the case where the car agent generates response voice data "Air conditioner is turned on with 25 degrees C. of temperature setting. Do you need any other help?", the car agent transmits the response voice data "Air conditioner is turned on with 25 degrees C. of temperature setting. Do you need any other help?" to the device **1700** (corresponding to Step S**2860** in FIG. **28**).

Then, the device **1700** receives the response voice data (corresponding to Step S**1960**: Yes in FIG. **19**), and outputs a voice "Air conditioner is turned on with 25 degrees C. of temperature setting. Do you need any other help?" (Step S**3525**, corresponding to Step S**1980** in FIG. **19**).

Since the voice "Air conditioner is turned on with 25 degrees C. of temperature setting. Do you need any other help?" is not a dialogue end voice (corresponding to Step S**1985**: No in FIG. **19**), the device **1700** performs second voice input processing (Step S**3530**, corresponding to Step S**1930** in FIG. **19**).

In the second voice input processing, in the case where the user inputs a voice "No. Thank you.", the device **1700** transmits input voice data "No. Thank you." to the car agent (corresponding to Step S**2040** in FIG. **20**).

Then, the car agent receives the input voice data (corresponding to Step S**2814**: Yes in FIG. **28**). Since the input voice data requests to terminate the communication (corresponding to Step S**2815**: Yes in FIG. **28**), the car agent terminates the communication with the device **1700** (corresponding to Step S**2870** in FIG. **28**), and transmits a disconnection response to the home agent (Step S**3598**, corresponding to Step S**2890** in FIG. **28**).

Then, the home agent receives the disconnection response (corresponding to Step S**2585**: Yes in FIG. **25**), and performs disconnection response processing (Step S**2970**, corresponding to Step S**2890** in FIG. **25**).

Here, in the disconnection processing, in the case where the voice dialogue agent **2200** generates response voice data "This ends dialogue.", the voice dialogue agent **2200** transmits the response voice data "This ends dialogue." to the device **1700** (corresponding to Step S**2720** in FIG. **27**).

Then, the device **1700** receives the response voice data (corresponding to Step S**1960**: Yes in FIG. **19**), and outputs a voice "This ends dialogue." (Step S**3555**, corresponding to Step S**1980** in FIG. **19**).

Since the voice "This ends dialogue." is a dialogue end voice (corresponding to Step S**1985**: Yes in FIG. **19**), the state is switched to the voice input receivable state (corresponding to Step S**1990** in FIG. **19**). The device **1700** ends the fourth device processing.

<Consideration>

According to the fourth modified voice dialogue system having the above configuration, in the case where the voice dialogue agent A determines that the voice dialogue agent B rather than the voice dialogue agent A is appropriate as a communication party of the user while the user of the fourth modified voice dialogue system communicates with the voice dialogue agent A, it is possible to change a voice dialogue agent as the communication party of the user from the voice dialogue agent A to the voice dialogue agent B.

With this configuration, even if the user does not know the type of service provided by each of the voice dialogue agents, the user can receive a service provided by a more appropriate voice dialogue agent.

Also, in this case, since the voice dialogue agent A transfers input voice data that is not modified to the voice dialogue agent B, the voice dialogue agent B performs voice recognition processing on the input voice data. As a result, the user can receive a more appropriate service from the voice dialogue agent B.

Embodiment 6

The following exemplifies an operation situation of the voice dialogue system **100** in Embodiment 1. Note that the

voice dialogue system **100** in Embodiment 1 may be of course operated in an operation situation other than the operation situation exemplified here.

FIG. **36**A is a diagram schematically showing an operation situation in which the voice dialogue system **100** in Embodiment 1 is operated.

In FIG. **36**A, a group **3600** is for example a company, an organization, or a family, and its size is not limited. A plurality of devices **3601** (devices A and B and so on) and a home gateway **3602** are disposed in the group **3600**. The devices **3601** include not only devices that are connectable to the Internet (for example, a smartphone, a PC, and a TV) but also devices that are disconnectable from the Internet by themselves (for example, an illumination lamp, a washing machine, a refrigerator). The devices **3601** may include devices that are disconnectable from the Internet by themselves but are connectable to the Internet via the home gateway **3602**. Also, the group **3600** includes a user **10** who uses the devices **3601**. For example, the devices which are disposed in the group **3600** each correspond to the device **140** in Embodiment 1.

A cloud server **3611** is disposed in a data center administration company **3610**. The cloud server **3611** is a virtual server that cooperates with various devices through the Internet. The cloud server **3611** mainly manages big data that is difficult to deal with by a normal data base management tool or the like. The data center administration company **3610** performs management of data and the cloud server **3611**, and administers a data center for performing such management. Services performed by the data center administration company **3610** are described in detail later. Here, the data center administration company **3610** is not limited to a company only performing data management, administration of the cloud server **3611**, and so on. For example, a device manufacturer developing and manufacturing one type of the devices **3601** may serve as the data administration center **3610** when the device manufacturer also performs data management and administration of the cloud server **3611** (see FIG. **36**B). Also, the data center administration company **3610** does not need to be a single company. For example, when a device manufacturer and another management company perform data management and administration of the cloud server **3611** together, then either one or both of the device manufacturer and the management company may serve as the data center administration company **3610** (see FIG. **36**C). For example, the data center administration company **3610** provides the voice dialogue agent **400** that is associated with the device **140** (hereinafter, referred to also as a first voice dialogue agent).

A service provider **3620** has a server **3621**. The server **3621** here for example includes a memory embedded in a PC for individual use, and its size is not limited. Also, there is a case where the service provider **3620** does not have the server **3621**. For example, the service provider **3620** provides another voice dialogue agent **400** that is connected to the first voice dialogue agent (hereinafter, referred to also as a second voice dialogue agent).

Next, an explanation is given on a flow of information in the above operation situation.

First, the device A or B, which is disposed in the group **3600**, transmits log information to the cloud server **3611**, which is disposed in the data center administration company **3610**. The cloud server **3611** accumulates the log information transmitted from the device A or B (arrow (a) in FIG. **36**A). Here, the log information is information indicating a driving situation, an operation time and date, and so on of the devices **3601**. The log information includes for example a viewing history of a TV, timer recording information of a recorder, a driving time and date and a laundry amount of a washing machine, and a time and date and the number of opening and closing a refrigerator. Without limiting to the information described above, the log information includes all information that is acquirable from all the devices **3601**. There is a case where the log information is provided directly from the devices **3601** to the cloud server **3611** through the Internet. Alternatively, the log information may be provided from the home gateway **3602** to the cloud server **3611** after being accumulated from the devices **3601** to the home gateway **3602**.

Next, the cloud server **3611**, which is disposed in the data center administration company **3610**, provides the accumulated log information to the service provider **3620** in certain units. Here, the log information may be provided in units according to which the data center administration company **3610** can organize the accumulated log information and provide the organized log information to the service provider **3620**. Alternatively, the log information may be provided in units requested by the service provider **3620**. Moreover, the log information may not be provided in certain units, and alternatively an amount of the log information to be provided sometimes varies in accordance with circumstances. The log information is stored as necessary in the server **3621** of the service provider **3620** (arrow (b) in FIG. **36**A). Then, the service provider **3620** organizes the log information so as to be adapted to a service to be provided to a user, and provides the organized information to the user. The user to which the organized information to be is provided may be the user **10** who uses the devices **3601** or an external user **20**. The service may be provided for example from the service provider **3620** directly to the user (arrow (e) in FIG. **36**A). Alternatively, the service may be provided for example to the user again via the cloud server **3611** of the data center administration company **3610** (arrows (c) and (d) in FIG. **36**A). Moreover, the cloud server **3611** of the data center administration company **3610** may organize the log information so as to be adapted to a service to be provided to the user, and provide the organized information to the service provider **3620**.

Note that the user **10** and the user **20** may be different or the same.

The following exemplifies several types of service that can be provided in the above operation situation.

<Service Type 1: Local Data Center Type>

FIG. **37** is a diagram schematically showing service type 1 (local data center type service).

Here, the service provider **3620** acquires information from the group **3600**, and provides a service to a user. In this type of service, the service provider **3620** has functions of a data center administration company. That is, the service provider **3620** includes a cloud server **3611** performing big data management. As such, there is no data center administration company.

In this type of service, the service provider **3620** administers and manages the data center (the cloud server **3611**) (**3703**). Also, the service provider **3620** manages an OS (**3702**) and an application (**3701**). The service provider **3620** performs service provision (**3704**) with use of the OS (**3702**) and application (**3701**), which are managed by thereby.

<Service Type 2: IaaS Type>

FIG. **38** is a diagram schematically showing service type 2 (IaaS (Infrastructure as a Service) type). Here, IaaS is a model in which infrastructure for constructing and operating a computer system is provided as a cloud service through the Internet.

In this type of service, the data center administration company **3610** administers and manages the data center (the cloud server **3611**) (**3703**). Further, the service provider **3620** manages the OS (**3702**) and the application (**3701**). The service provider **3620** performs service provision (**3704**) with use of the OS (**3702**) and the application (**3701**), which are managed thereby.

<Service Type 3: PaaS Type>

FIG. **39** is a diagram schematically showing service type 3 (PaaS (Platform as a Service) type). Here, PaaS is a model in which a platform for constructing and operating software is provided as a service through the Internet.

In this type of service, the data center administration company **3610** manages the OS (**3702**), and administers and manages the data center (the cloud server **3611**) (**3703**). Further, the service provider **3620** manages the application (**3701**). The service provider **3620** performs service provision (**3704**) with use of the OS (**3702**), which is managed by the data center administration company **3610**, and the application (**3701**), which is managed by the service provider **3620**.

<Service Type 4: SaaS Type>

FIG. **40** is a diagram schematically showing service type 4 (SaaS (Software as a Service) type). In this model, for example, an application that is provided by a platform provider having a data center (a cloud server) is provided to a business or a person (a user) without having a data center (a cloud server) as a cloud service through a network such as the Internet.

In this type of service, the data center administration company **3610** manages the application (**3701**), manages the OS (**3702**), and administers and manages the data center (the cloud server **3611**) (**3703**). Further, the service provider **3620** performs service provision (**3704**) with use of the application (**3701**) and the OS (**3702**), which are managed by the data center administration company **3610**.

The main actor in service provision is the service provider **3620** in all of the above service types. Further, for example, the service provider **3620** or the data center administration company **3610** may develop their own OS, application, or big data database, or may outsource any of these to a third party.

<Supplement>

One aspect of the voice dialogue method relating to the present invention and one aspect of the device relating to the present invention have been explained by exemplifying the five voice dialogue systems in Embodiments 1 to 5 and the operation situation of the voice dialogue system in Embodiment 6. However, the voice dialogue method and the device relating to the present invention are not of course limited to the voice dialogue method and the device as used in the voice dialogue system and the operation situation which are exemplified in Embodiments 1 to 6.

(1) In Embodiment 1, the voice dialogue system **100** has been explained to include the voice dialogue agent server **110**, the network **120**, the gateway **130**, and the device **140** as shown in FIG. **1**. A voice dialogue system as another example may include a mediation server **4150** in addition to the voice dialogue agent server **110**, the network **120**, the gateway **130**, and the device **140**. The mediation server **4150** has a function of storing therein the target agent DB **2300**, associating between the voice dialogue agents, switching a connection destination, and so on.

FIG. **41** is a system configuration diagram showing configuration of a voice dialogue system **4100** that includes the mediation server **4150**.

FIG. **42** is a block diagram showing functional configuration of the mediation server **4150**.

As shown in the figure, the mediation server **4150** includes a communication unit **4220**, a control unit **4210**, and a target agent DB storage unit **4230**.

Here, the target agent DB storage unit **4230** has a function of storing therein the target agent DB **2300**, similarly to the target agent DB storage unit **2220** in Embodiment 4.

Also, a voice dialogue system as further another example may include a mediation server **4350** instead of the mediation server **4150**. The mediation server **4350** has a function of storing therein the available service DB **3100**, associating between the voice dialogue agents, switching a connection destination, and so on.

FIG. **43** is a block diagram showing functional configuration of the mediation server **4350**.

As shown in the figure, the mediation server **4350** includes a communication unit **4320**, a control unit **4310**, and an available service DB storage unit **4330**.

Here, the available service DB storage unit **4330** has a function of storing therein the available service DB **3100**, similarly to the available service DB storage unit **3020** in Embodiment 5.

(2) In Embodiment 1, the image shown in FIG. **12** is exemplified as an image displayed on the display unit **270** included in the device **140**.

Another examples of this image are shown in FIG. **44**A to FIG. **44**D, FIG. **45**A, and FIG. **45**B.

In the examples in FIG. **12**, FIG. **44**A to FIG. **44**D, and FIG. **45**B, displayed response texts each include, at the beginning thereof, a character string specifying a subject outputting a voice such as "You", "Car agent", "Home agent", or the like. Also, in the example in FIG. **45**A, an icon (image) specifying a subject outputting a voice is displayed.

In the examples in FIG. **44**A and FIG. **44**B, a character string specifying a voice dialogue agent with which the user currently makes a dialogue is displayed on an upper part of the screen such that the user recognizes the voice dialogue agent with which the user currently makes a dialogue. Such a character strings displayed here are "Dialogue with home agent" and "Dialogue with car agent".

In the example in FIG. **44**D, a character string specifying a voice dialogue agent with which the user currently makes a dialogue (or has made a dialogue in the past) is included in each of the displayed response texts, such that the user recognizes the voice dialogue agent with which the user currently makes a dialogue (or has made a dialogue in the past). Such a character strings displayed here are "Dialogue party is home agent" and "Dialogue party is car agent". Also, in the example in FIG. **45**B, an icon (image) specifying a voice dialogue agent with which the user currently makes a dialogue (or has made a dialogue in the past) is displayed.

These display examples are just examples. Alternatively, a voice dialogue agent with which the user currently makes a dialogue may be indicated by color, shape of the screen, shape of part of the screen, or the like. Furthermore, each subject outputting a voice may be indicated by changing a background color, a wall paper, and the like on the display. In this way, it is only necessary to display a voice dialogue agent with which the user makes a dialogue or a subject outputting a voice so as to be recognizable by the user.

(3) In Embodiment 1 and the modifications, the example has been explained that a voice dialogue agent with which the user makes a dialogue or a subject outputting a voice is displayed so as to be visually recognizable by the user. However, the present invention is not necessarily limited to the example where a voice dialogue agent with which the

user makes a dialogue or a subject outputting a voice is displayed so as to be visually recognizable by the user, as long as the voice dialogue agent with which the user makes a dialogue or the subject outputting a voice is recognizable by the user.

For example, a voice "Dialogue party is home agent" may be output, such that a voice dialogue agent with which the user makes a dialogue is recognizable by the user. Alternatively, a sound effect may be output, such that the voice dialogue agent with which the user makes a dialogue is recognizable by the user. Further alternatively, the voice dialogue agent with which the user makes a dialogue may be indicated by changing voice tone, speech rate, voice volume, or the like.

(4) In Embodiment 1, the explanation has been provided that the state is managed by the control unit **210** in the form as shown in the switching of the state shown in FIG. **3**. Also, in Embodiment 2, the explanation has been provided that the state is managed by the control unit **1310** in the form as shown in the switching of the state shown in FIG. **14**. Furthermore, in Embodiment 3, the explanation has been provided that the state is managed by the control unit **1710** in the form as shown in the switching of the state shown in FIG. **18**.

Management of the state performed by the control unit is not limited to be in the above forms. Alternatively, other forms for managing the state may be employed. FIG. **46** to FIG. **50** each show an example of switching of the state managed by the control unit in other forms.

For example, according to management of the state in a form shown in switching of the state in FIG. **48**, in the case where a voice output by the voice output unit **260** based on a response text transmitted from the voice dialogue agent **110** is a dialogue end voice, the state is switched to the voice input unreceivable state even if the predetermined period has not lapsed after the switching of the state to the voice input receivable state. Accordingly, in the case where a voice signal, which is generated by the voice dialogue agent **110** and received by the communication unit **250**, indicates unnecessity of a new voice input, the voice input unit **220** is switched to the voice input unreceivable state even if the predetermined period has not lapsed after the switching to the voice input receivable state.

(5) In Embodiment 1, the display unit **270** has been explained, for example, as being embodied by a touchpanel, a touchpanel controller, and a processor that executes programs, and having the configuration of displaying that the display unit **270** is in the voice input receivable state by blinking the region **1120** that is positioned at the lower right in the display unit **270** (see FIG. **11**A, FIG. **11**C, FIG. **12**, and so on). However, the configuration of the display unit **270** is not limited to the above configuration example as long as the user can recognize that the display unit **270** is in the voice input receivable state. Another configuration example may be employed in which the display unit **270** is embodied by an LED (Light Emitting Diode) and a processor that executes programs, and displays that the display unit **270** is in the voice input receivable state by lighting the LED. In the other configuration example, the display unit **270** does not display a response text received by the communication unit **250** because of not including means for displaying character strings.

(6) In Embodiment 1, the explanation has been provided that the communication unit **250** has the configuration in which in the case where a specific one of the voice dialogue agent servers **110** is not designated as a voice dialogue agent server **110** that is a communication party, the communication unit **250** communicates with a specific voice dialogue agent server with reference to an IP address stored in the address storage unit **240**. Alternatively, another configuration example may be employed in which the address storage unit **240** does not store therein the IP address of the specific voice dialogue agent server, and the communication unit **250** communicates with a voice dialogue agent server designated by the user or a voice dialogue agent server that embodies the voice dialogue agent designated by the user.

(7) In Embodiment 1, the devices **140** each have been explained as communicating with the voice dialogue agent **110** via the gateway **130** and the network **120**.

Alternatively, another configuration may be employed in which the devices **140** may each have a function of directly connecting with the network **120** without the gateway **130** and communicate with the voice dialogue agent without the gateway **130**. In the case where all the devices **140** are directly connected to the network **120** without the gateway **130**, the gateway **130** is not necessary.

(8) Part or all of the elements constituting the above embodiments and modifications may be configured from a single system LSI. The system LSI is a super multifunctional LSI that is manufactured by integrating a plurality of components on a single chip. Specifically, the system LSI is a computer system composed of a microprocessor, a ROM, a RAM, and so on. Functions of the system LSI are achieved by the microprocessor operating in accordance with a computer program that is stored in the ROM, the RAM, or the like.

(9) Part or all of the elements constituting the above embodiments and modifications may be composed of an IC (Integrated Circuit) card detachable from a device or a module. The IC card or the module is a computer system composed of a microprocessor, a ROM, a RAM, and so on. The IC card or the module may include the above super multifunctional LSI. Functions of the IC card or the module are achieved by the microprocessor operating in accordance with a computer program that is stored in the ROM, the RAM, or the like. The IC card or the module may be each tamper-resistant.

(10) The computer program or the digital signal which is used in the above embodiments and modifications may be recorded in a computer-readable recording medium such as a flexible disk, a hard disk, a CD-ROM, an MD, a DVD, a DVD-ROM, a DVD-RAM, a BD, a semiconductor memory, or the like.

Also, the computer program or the digital signal which is used in the above embodiments and modifications may be transmitted through an electric communication network, a wireless or wired communication network, a network such as the Internet, data broadcasting, or the like.

The computer program or the digital signal which is used in the above embodiments and modifications can be implemented in another computer system, by transmitting the computer program or the digital signal which is recorded in the recording medium to the other computer system, or by transmitting the computer program or the digital signal to the other computer system via the network.

(12) The above embodiments and modifications may be combined with each other.

(13) The following further explains configurations, modifications, and effects of the voice dialogue method and the device relating to one aspect of the present invention.

(a) One aspect of the present invention provides a voice dialogue method that is performed by a voice dialogue system, the voice dialogue system including: a voice signal generation unit; a voice dialogue agent unit; a voice output

unit; and a voice input control unit, the voice dialogue method comprising: a step of, by the voice signal generation unit, receiving a voice input and generating a voice signal based on the received voice input; a step of, by the voice dialogue agent unit, performing voice recognition processing on the generated voice signal and performing processing based on a result of the voice recognition processing to generate a response signal; a step of, by the voice output unit, outputting a voice based on the generated response signal; and a step of, when the voice output unit outputs the voice, by the voice input control unit, keeping the voice signal generation unit in a receivable state for a predetermined period after output of the voice, the receivable state being a state in which a voice input is receivable.

According to the voice dialogue method relating to one aspect of the present invention, in the case where a voice generated by the voice dialogue agent unit is output, a user can input a voice without performing an operation with respect to the voice dialogue system. This reduces the number of times that the user needs to perform an operation in accordance with a voice that is dialogically input, compared with conventional techniques.

(b) Also, the voice dialogue system may further include a display unit, and the voice dialogue method may further comprise a step of, while the voice signal generation unit is in the receivable state, by the display unit, displaying that the voice signal generation unit is in the receivable state.

This configuration allows the user to visually recognize whether or not the voice signal generation unit is in the receivable state.

(c) Also, the voice dialogue system may further include an additional voice dialogue agent unit, and the voice dialogue method may further comprise: a step of, by the voice dialogue agent unit, determining, based on the result of the voice recognition processing, which one of the voice dialogue agent unit and the additional voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing; a step of, when the voice dialogue agent unit determines that the voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing, by the voice dialogue agent unit, performing the processing based on the result of the voice recognition processing; a step of, when the voice dialogue agent unit determines that the additional voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing, by the additional voice dialogue agent unit, performing voice recognition processing on a voice received by the voice signal generation unit, performing processing based on a result of the voice recognition processing performed by the additional voice dialogue agent unit to generate a response signal; and a step of, by the voice output unit, outputting a voice based on the response signal generated by the additional voice dialogue agent unit.

According to this configuration, it is possible to cause the additional voice dialogue agent unit to perform processing that is appropriate for being performed by the additional voice dialogue agent unit rather than the voice dialogue agent unit.

(d) Also, the voice dialogue method may further comprise: a step of, when the voice dialogue agent unit determines that the voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing, by the display unit, displaying that the voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing; and a step of, when the voice dialogue agent unit determines that the additional voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing, by the display unit, displaying that the additional voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing.

This configuration allows the user to visually recognize which one of the voice dialogue agent unit and the additional voice dialogue agent unit is appropriate for performing the processing.

(e) Also, the voice dialogue method may further comprise a step of, when the voice dialogue agent unit determines that the additional voice dialogue agent unit is appropriate for performing the processing based on the result of the voice recognition processing, by the voice dialogue agent unit, transferring a voice signal generated by the voice signal generation unit to the additional voice dialogue agent unit, and by the additional voice dialogue agent unit, performing voice recognition processing on the transferred voice signal.

This configuration allows the additional voice dialogue agent unit to perform the voice recognition processing with use of the voice signal transferred from the voice dialogue agent unit.

(f) Also, the voice dialogue method may further comprise a step of, when the voice signal generation unit is in the receivable state and a response signal generated by the voice dialogue agent unit indicates that a new voice input does not need to be received, by the voice input control unit, switching the voice signal generation unit to an unreceivable state even during the predetermined period, the unreceivable state being a state in which a voice input is unreceivable.

According to this configuration, in the case where a voice input does not need to be received, it is possible to switch the voice signal generation unit to the unreceivable state even during the predetermined period.

(g) One aspect of the present invention provides a device comprising: a voice signal generation unit configured to receive a voice input and generate a voice signal based on the received voice input; a transmission unit configured to transmit the generated voice signal to an external server: a reception unit configured to receive a response signal that is returned from the server, the response signal being generated by the server based on the voice signal; a voice output unit configured to output a voice based on the received response signal; and a voice input control unit configured to, when the voice output unit outputs a voice, keep the voice signal generation unit in a receivable state for a predetermined period after output of the voice, the receivable state being a state in which a voice input is receivable.

According to the device relating to the one aspect of the present invention, in the case where a voice generated by the server is output, the user can input a voice without performing an operation with respect to the device. This reduces the number of times that the user needs to perform an operation in accordance with a voice that is dialogically input, compared with a conventional technique.

INDUSTRIAL APPLICABILITY

The voice dialogue method and the device relating to the present invention are widely utilizable for a voice dialogue system that performs processing based on a voice that is dialogically input by a user.

REFERENCE SIGNS LIST

100 voice dialogue system
110 voice dialogue agent server

120 network
130 gateway
140 device
210 control unit
220 voice input unit
230 operation reception unit
240 address storage unit
250 communication unit
260 voice output unit
270 display unit
280 execution unit
400 voice dialogue agent
410 control unit
420 communication unit
430 voice recognition processing unit
440 dialogue DB storage unit
450 voice synthesizing processing unit
460 instruction generation unit

The invention claimed is:

1. A voice dialogue method that is performed by a voice dialogue system, the voice dialogue system including: [a voice signal generation unit; a voice dialogue agent unit; an additional voice dialogue agent unit; a voice output unit; and a voice input control unit] *a first device; a second device; a first voice dialogue agent server; and a second voice dialogue agent server*, *wherein*

the first device is a computer-embedded device that is capable of connecting to a network and performing input and output via a voice with a user,

the first voice dialogue agent server and the second voice dialogue agent server are each a voice dialogue agent server that is accessed by the first device via the network, and is capable of performing, as an agent for the first device, recognition of a voice inputted by the device and synthesizing of a voice to be outputted by the first device, and

the voice dialogue method [comprising] *comprises*:

[a step of, by the voice signal generation unit,] receiving a voice input [and] *at the first device;*

generating a voice signal *at the first device* based on the received voice input, *and transmitting the voice signal from the first device to the first voice dialogue agent server*;

[a step of, by the voice dialogue agent unit,] performing voice recognition processing on the generated voice signal [and] *at the first voice dialogue agent server to generate first text input;*

determining, *at the first voice dialogue agent server* based on [a result of the voice recognition processing] *the generated first text input* and agent information, which one of the [voice dialogue agent unit] *first voice dialogue agent server* and the [additional voice dialogue agent unit] *second voice dialogue agent server* is appropriate for performing voice-related processing that is processing based on the voice signal, the agent information being stored in a memory included in the [voice dialogue agent unit] *first voice dialogue agent server* and associating the [additional voice dialogue agent unit] *second voice dialogue agent server* with one or more keywords;

[a step of, when the voice dialogue agent unit determines that the voice dialogue agent unit is appropriate for performing the voice-related processing, by the voice dialogue agent unit, performing processing based on the result of the voice recognition processing to generate a response signal, and by the voice output unit, outputting a voice based on the response signal generated by the voice dialogue agent unit;

a step of, when the voice dialogue agent unit determines that the additional voice dialogue agent unit is appropriate for performing the voice-related processing, by the voice dialogue agent unit, transferring the voice signal to the additional voice dialogue agent unit, by the additional voice dialogue agent unit, performing new voice recognition processing on the transferred voice signal and performing processing based on a result of the new voice recognition processing to generate a response signal, and by the voice output unit, outputting a voice based on the response signal generated by the additional voice dialogue agent unit; and

a step of, when the voice output unit outputs a voice, by the voice input control unit, keeping the voice signal generation unit in a receivable state for a predetermined period after output of the voice, the receivable state being a state in which a voice input is receivable]

when the determining determines that the first voice dialogue agent server is appropriate for performing the voice-related processing, (i) generating, from the generated first text input, a first instruction set for the first device or another device associated with the first voice dialogue agent server, (ii) executing the generated first instruction set using the first device or the other device associated with the first voice dialogue agent server, (iii) generating a first response signal based on the execution of the generated first instruction set using the first device or the other device associated with the first voice dialogue agent server, (iv) transmitting the generated first response signal from the first voice dialogue agent server to the first device, and (v) outputting a voice at the first device based on the received first response signal generated at the first voice dialogue agent server;

when the determining determines that the second dialogue agent server is appropriate for performing the voice-related processing, (i) transferring the voice signal from the first voice dialogue agent server to the second voice dialogue agent server, (ii) performing new voice recognition processing on the transferred voice signal at the second voice dialogue agent server to generate second text input, (iii) generating, from the generated second text input, a second instruction set for the second device, (iv) executing the generated second instruction set using the second device, (v) generating a second response signal based on the execution of the generated second instruction set using the second device, (vi) transmitting the generated second response signal from the second voice dialogue agent server to the first device, and (vii) outputting a voice at the first device based on the received second response signal generated at the second voice dialogue agent server; and

displaying, on a screen of the first device or a screen of the second device, a text character string obtained by recognizing voice input from the user and a text character string indicating a response signal by the first device or the second device, while indicating a distinction between the user, the first voice dialogue agent server, and the second voice dialogue agent server.

2. The voice dialogue method of claim [**1**] *6*, wherein

the voice dialogue system further includes a display [unit], and

the voice dialogue method further comprises

[a step of, while the voice signal generation unit] *when the device* is in the receivable state, [by the display unit,] displaying *on the display* that the [voice signal generation unit] *first device* is in the receivable state.

3. The voice dialogue method of claim **2**, further comprising:

[a step of, when the voice dialogue agent unit determines that the voice dialogue agent unit is appropriate for performing the voice-related processing, by the display unit,] *when the determining determines that the first voice dialogue agent server is appropriate for performing the voice-related processing,* displaying *on the display* that the [voice dialogue agent unit] *first voice dialogue agent server* is appropriate for performing the voice-related processing; and

[a step of, when the voice dialogue agent unit determines that the additional voice dialogue agent unit is appropriate for performing the voice-related processing, by the display unit,] *when the determining determines that the second dialogue agent server is appropriate for performing the voice-related processing,* displaying *on the display* that the [additional voice dialogue agent unit] *second voice dialogue agent server* is appropriate for performing the voice-related processing.

4. The voice dialogue method of claim **2**, further comprising

[a step of,] when the [voice signal generation unit] *first device* is in the receivable state and a response signal generated by the [voice dialogue agent unit] *first voice dialogue agent server* indicates that a new voice input does not need to be received, [by the voice input control unit,] switching the [voice signal generation unit] *first device* to an unreceivable state even during the predetermined period, the unreceivable state being a state in which a voice input is unreceivable.

5. The voice dialogue method of claim **1**, wherein

the [additional voice dialogue agent unit] *second voice dialogue agent server* is provided in plural,

the agent information associates each of a plurality of identifiers with one or more keywords, the identifiers each identifying one of the [additional voice dialogue agent units] *second voice dialogue agent servers*, and

the voice dialogue method further comprises

[a step of,] when any of the keywords is included in the result of the [voice recognition processing, by the voice dialogue agent unit] *generated first text input*, determining, *at the first voice dialogue agent server,* that one of the [additional voice dialogue agent units] *second voice dialogue agent servers* that is identified by an identifier associated with the included keyword is appropriate for performing the voice-related processing.

6. The voice dialogue method of claim 1, further comprising

when the first device outputs a voice, keeping the first device in a receivable state for a predetermined period after output of the voice, the receivable state being a state in which a voice input is receivable at the first device.

7. The voice dialogue method of claim 1,

wherein the first device or the other device associated with the first voice dialogue agent server is disposed in a home, and the second device is disposed in a vehicle.

8. The voice dialogue method of claim 7,

wherein the first device is one of a television, an air conditioner, a recorder, a washing machine, and a portable smartphone,

wherein the other device associated with the first voice dialogue agent server is different from the first device and is one of a television, an air conditioner, a recorder, a washing machine, and a portable smartphone, and

wherein second device is one of a car air conditioner and a car navigation system.

9. The voice dialogue method of claim 1,

wherein the first device includes a display which displays (i) when the determining determines that the first voice dialogue agent server is appropriate for performing the voice-related processing, a first character string or a first icon identifying the first voice dialogue agent server and the received first response signal, and (ii) when the determining determines that the second dialogue agent server is appropriate for performing the voice-related processing, a second character string or a second icon identifying the second voice dialogue agent server and the received second response signal.

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