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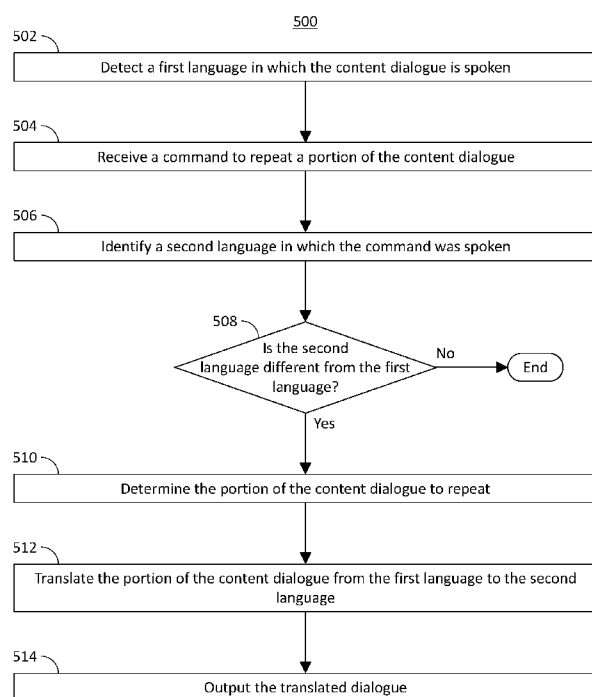


FIG. 5

(57) Abstract: Systems and methods are described herein for replaying content dialogue in an alternate language in response to a user command. While the content is playing on a media device, a first language in which the content dialogue is spoken is identified. Upon receiving a voice command to repeat a portion of the dialogue, the language in which the command was spoken is identified. The portion of the content dialogue to repeat is identified and translated from the first language to the second language. The translated portion of the content dialogue is then output. In this way, the user can simply ask in their native language for the dialogue to be repeated and the repeated portion of the dialogue is presented in the user's native language.

SYSTEMS AND METHODS FOR REPLAYING CONTENT DIALOGUE IN AN ALTERNATE LANGUAGE

Background

[0001] The present disclosure relates to content delivery and consumption systems and, more particularly, providing alternate language support for media content.

5 Summary

[0002] In the modern world of global data traffic, media content produced in one country is often made available in other countries. People of each country often have their own language and may not be able to understand, or may have difficulty understanding, the language in which the media content was produced. Many content producers include some alternate language data,
10 but often only one or two languages are included, and a user may desire to view and/or hear at least some portions of the media content in a language that is not included.

[0003] Systems and methods are described herein for replaying content dialogue in an alternate language in response to a user command. While the content is playing on a media device, a first language in which the content dialogue is spoken is identified. Upon receiving a
15 command to repeat a portion of the dialogue, the language in which the command was spoken is identified. The portion of the content dialogue to repeat is identified and translated from the first language to the second language. The translated portion of the content dialogue is then output. In this way, the user can simply ask in their native language for the dialogue to be repeated and the repeated portion of the dialogue is presented in the user's native language.

[0004] To translate the identified portion of the dialogue, the media device accesses subtitle text associated with the portion of the content dialogue. The media device translates the subtitle text to the second language and outputs for display the translated subtitles. Alternatively or additionally, the media device accesses audio data associated with the portion of the dialogue.

5 The media device transcribes the audio into text and translates the text. The media device then uses a speech synthesizer to output audio of the translated dialogue.

[0005] The media device may determine the portion of the dialogue to repeat in several ways. In one example, the media device identifies a time at which the command was received and a duration of the command. The media device then calculates the start time of the command
10 and identifies a portion of the dialogue in progress at the time start time of the command.

[0006] In a second example, the media device identifies a plurality of portions of the content dialogue within a predefined amount of time prior to the time at which the command was received. The media device determines an accent with which each portion of dialogue was spoken, compares all of the determined accents and determines, based on the comparison,
15 whether any portion is spoken with an accent relative to the other portions. If a portion of the dialogue is spoken with an accent relative to the other portions, the media device selects that portion of the dialogue for translation.

[0007] The media device may, in a third example, determine the portion of the dialogue to repeat by determining a word count and duration of each portion of dialogue within the
20 predefined time prior to the time the command was received. The media device then selects the portion of the dialogue having both the highest word count and the shortest duration for translation.

[0008] The media device detects the first language by transcribing a portion of the dialogue and comparing at least a first word of the transcribed text with a database of languages. If more
25 than one language is identified as using the first word, additional words are compared until only one language is identified.

Brief Description of the Drawings

[0009] The above and other objects and advantages of the disclosure will be apparent upon
30 consideration of the following detailed description, taken in conjunction with the accompanying drawings, in which like reference characters refer to like parts throughout, and in which:

[0010] FIG. 1 shows a generalized embodiment of a command to repeat dialogue in an alternate language in accordance with some embodiments of the disclosure;

[0011] FIG. 2 shows a generalized embodiment of dialogue presented in an alternate language in accordance with some embodiments of the disclosure;

5 [0012] FIG. 3 shows another generalized embodiment of dialogue presented in an alternate language in accordance with some embodiments of the disclosure;

[0013] FIG. 4 is a block diagram representing control circuitry and data flow within a media device in response to a command to repeat dialogue in accordance with some embodiments of the disclosure;

10 [0014] FIG. 5 is a flowchart representing a process for outputting translated dialogue in accordance with some embodiments of the disclosure;

[0015] FIG. 6 is a flowchart representing a process for generating subtitles for display comprising translated dialogue in accordance with some embodiments of the disclosure;

[0016] FIG. 7 is a flowchart representing a process for generating translated dialogue for
15 audio output in accordance with some embodiments of the disclosure;

[0017] FIG. 8 is a flowchart representing a process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the disclosure;

[0018] FIG. 9 is a flowchart representing another process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the
20 disclosure;

[0019] FIG. 10 is a flowchart representing a third process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the disclosure; and

[0020] FIG. 11 is a flowchart representing a process for identifying an alternate language in
25 accordance with some embodiments of the disclosure.

Detailed Description

[0021] FIG. 1 depicts a user entering a command to repeat dialogue in an alternate language. Content 102 contains dialogue in a first language. While content 102 is being consumed on a
30 media device 100, media device 100 identifies the first language. A user may request that a portion of dialogue (*e.g.*, portion 104) be repeated using, for example, a voice command 106.

Upon receiving the voice command 106, media device 100 identifies the language in which the voice command 106 was spoken. The media device 100 identifies the portion of the content dialogue 104 to repeat and translates the identified portion 104 from the first language to the second language. The media device 100 then outputs the translated portion of the content dialogue 108. Audio of the translated portion of the content dialogue 108 may be output using speakers integral to media device 100, external speakers physically connected to media device 100, or an audio output device to which media device 100 is connected via a wireless connection (*e.g.*, Bluetooth speakers or an IoT device).

[0022] FIGS. 2 and 3 depict embodiments of presentations of the dialogue in an alternate language. In response to the voice command 106, the media device 100 may translate dialogue 200, which may be displayed as subtitles overlaying the content, and display in its place translated dialogue subtitle 202 (FIG. 2). Alternatively or additionally, the media device 100 may, access audio 300 corresponding to the dialogue and generate translated audio 302 for output (FIG. 3).

[0023] FIG. 4 is an illustrative block diagram representing circuitry and data flow within media device 100 in accordance with some embodiments of the disclosure. Media device 100 may be any device for accessing the content described above, such as a television, a Smart TV, a set-top box, an integrated receiver decoder (IRD) for handling satellite television, a digital storage device, a digital media receiver (DMR), a digital media adapter (DMA), a streaming media device, a DVD player, a DVD recorder, a connected DVD, a local media server, a BLU-RAY player, a BLU-RAY recorder, a personal computer (PC), a laptop computer, a tablet computer, a WebTV box, a personal computer television (PC/TV), a PC media server, a PC media center, a hand-held computer, a stationary telephone, a personal digital assistant (PDA), a mobile telephone, a portable video player, a portable music player, a portable gaming machine, a smart phone, or any other television equipment, computing equipment, or wireless device, and/or combination of the same. Media device 100 comprises a microphone 408. Microphone 408 may be a discrete component or may be integrated with other capture devices such as a camera. Media device 100 receives voice command 106 to repeat a portion of the dialogue using microphone 408. Media device 100 also comprises control circuitry 400. Control circuitry 400 may be based on any suitable processing circuitry and comprises control circuits and memory circuits which may be disposed on a single integrated circuit or may be discrete components. As

referred to herein, processing circuitry should be understood to mean circuitry based on one or more microprocessors, microcontrollers, digital signal processors, programmable logic devices, field-programmable gate arrays (FPGAs), application-specific integrated circuits (ASICs), etc., and may include a multi-core processor (*e.g.*, dual-core, quad-core, hexa-core, or any suitable number of cores) or supercomputer. In some embodiments, processing circuitry may be distributed across multiple separate processors or processing units, for example, multiple of the same type of processing units (*e.g.*, two Intel Core i7 processors) or multiple different processors (*e.g.*, an Intel Core i5 processor and an Intel Core i7 processor). Some control circuits may be implemented in hardware, firmware, or software. Microphone 408 may be integrated with control circuitry 400.

[0024] Control circuitry 400 comprises media access and playback circuitry 402. Media access and playback circuitry 402 receives content 102 from a content provider. The content provider may be a service (*e.g.*, Netflix), a television network (*e.g.*, NBC), or a media company (*e.g.*, NBCUniversal). Content 102 may be received via a physical RF channel over a cable television connection or terrestrial broadcast, or may be received over an Internet connection from an over-the-top (OTT) service using a wired connection (*e.g.*, Ethernet) or wireless connection (*e.g.*, 802.11a/b/g/n (WiFi), WiMax, GSM, UTMS, CDMA, TDMA, 3G, 4G, 4G LTE, or any other suitable type of wireless data transmission). Media access and playback circuitry processes content 102 and outputs a corresponding video signal 102a and audio signal 102b using video output circuitry 404 and audio output circuitry 406, respectively.

[0025] Control circuitry 400 also comprises input circuitry 412. Input circuitry 412 receives 410 voice command 106 from microphone 408. Upon receiving voice command 106, input circuitry transfers 414 the audio data to language processing circuitry 416, which comprises language identification circuitry 418 and language translation circuitry 420. The audio data is processed using language identification circuitry 418 to determine the language in which the voice command 106 was spoken. For example, language identification circuitry 418 transcribes the audio into text and compares at least one word of the transcribed text to a language database, which may be stored locally in a memory of media device 100, or at a remote server. The language database may return an identifier of a language or languages in which the word appears. Language circuitry 418 may continue comparing words to the database until only a single language identifier is returned.

[0026] The input circuitry 412 also sends a command 422 to dialogue identification circuitry 424 to identify a portion of the content dialogue to translate. Dialogue identification circuitry 424 accesses audio data corresponding to the content 106 and identifies discrete portions of dialogue. For example, dialogue identification circuitry 106 may use frequency analysis to determine when each character in content 106 is speaking. Alternatively or additionally, dialogue identification circuitry 424 may access subtitle data of content 106 and identify discrete portions of the subtitle data corresponding to discrete portions of dialogue. Dialogue identification circuitry determines, based on a time the voice command 106 was received, a particular portion of the content dialogue to be translated.

[0027] Media access and playback circuitry 402 receives 426, from language identification circuitry 418, the identified language in which the voice command 106 was spoken. Media access and playback circuitry 402 also receives 428, from dialogue identification circuitry 424, an indication of the portion of dialogue to be translated. Media access and playback circuitry 402 may use the identified language to determine if a translation of the dialogue in the identified language is already included in the content 102. For example, content 102 may comprise a secondary audio stream with dialogue in the identified language. Media access and playback circuitry 402 extracts the identified portion of dialogue and any preexisting translation and transfers them 430 to language translation circuitry 420. Language translation circuitry 420 translates the extracted portion of the dialogue into the identified language. For example, language translation circuitry 420 transcribes the dialogue into text and processes the text through a translation algorithm to generate translated text corresponding to the dialogue. Language translation circuitry 420 generates audio corresponding to the translated text using a speech synthesizer, and transfers 432 the audio to audio output circuitry 406 for output. Audio output circuitry 406 may be connected to speakers that are integral to media device 100, a physical audio connector (*e.g.*, a headphone jack) for use with external speakers, or a wireless audio connection (*e.g.*, Bluetooth or WiFi) for use with an IoT audio device. In cases where a preexisting translation is available, language translation circuitry passes the translated audio directly to audio output circuitry 406 without further processing. In cases where subtitles are available in the identified language, language translation circuitry performs speech synthesis using the preexisting subtitle text.

[0028] FIG. 5 is a flowchart representing an illustrative process for outputting translated dialogue in accordance with some embodiments of the disclosure. The flowchart in FIG. 5 represents a process 500 implemented on control circuitry 400 for outputting translated dialogue according to an embodiment of the disclosure. In addition, one or more actions of process 500 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0029] At 502, control circuitry 400 detects a first language in which the content dialogue is spoken. For example, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) extracts a segment of audio data from the content 102. Control circuitry processes the extracted audio (*e.g.*, using language processing circuitry 416) by transcribing the audio into corresponding text of the first language. For example, language processing circuitry 416 analyzes the audio of the content dialogue to identify various phonemes and compares the phonemes to a database of known words to determine which words were spoken in the content dialogue. Control circuitry 400 identifies the first language based on the transcribed text. This may be accomplished using methods described below in reference to FIG. 11. Alternatively, if the content 102 includes metadata indicating the language in which the content dialogue is spoken, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) retrieves the metadata indicating the language in which the content dialogue is spoken.

[0030] At 504, control circuitry 400 (*e.g.*, using input circuitry 412) receives a command to repeat a portion of the content dialogue. The command may be an analog or digital signal received from a user input device, such as a remote control or the user's mobile device. The command may be a voice command received from the user input device or using microphone 408.

[0031] At 506, control circuitry 400 identifies a second language used by the user. If the command is a text command, control circuitry 400 identifies the language of the text. This may be accomplished using methods described below in reference to FIG. 11. If the command is received from a remote control, control circuitry 400 may access a user profile to determine the user's preferred language. If the command is a voice command, control circuitry 400 transcribes the voice command into text of the second language and identifies the second language based on the transcribed text. This may be accomplished using methods described below in reference to FIG. 11.

[0032] At 508, control circuitry 400 determines whether the second language is different from the first language. Control circuitry 400 compares the language identifier of the first language with the language identifier of the second language. If the identifier of the first language does not match the identifier of the second language, then, at step 510, control
5 circuitry 400 determines the portion of the content dialogue to repeat. This may be accomplished using methods described below in reference to FIGS. 8-10.

[0033] At 512, control circuitry 400 translates the portion of the content dialogue from the first language to the second language. Control circuitry 400 (*e.g.*, using media access and playback circuitry 402) retrieves the audio data corresponding to the portion of the content
10 dialogue. Control circuitry 400 then, using language processing circuitry 416, transcribes the portion of the content dialogue into corresponding text of the first language using methods described above, and translates the transcribed text into text of the second language. Control circuitry 400 may transmit the transcribed text to a third party translation service, such as Google Translate, or may perform the translation locally using any known methods.

15 [0034] At 514, control circuitry 400 outputs the translated content dialogue. This may be accomplished using methods described below in reference to FIGS. 6-7.

[0035] The actions or descriptions of FIG. 5 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in relation to FIG. 5 may be done in suitable alternative orders or in parallel to further the purposes of this disclosure.

20 [0036] FIG. 6 is a flowchart representing an illustrative process for generating subtitles for display comprising translated dialogue in accordance with some embodiments of the disclosure. The flowchart in FIG. 6 represents a process 600 implemented on control circuitry 400 for generating subtitles for display comprising translated dialogue according to an embodiment of the disclosure. In addition, one or more actions of process 600 may be incorporated into or
25 combined with one or more actions of any other process or embodiment described herein.

[0037] At 602, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) accesses metadata of the content 102. For example, content 102 may be an MPEG-2 stream, which contains metadata such as program specific information (*e.g.*, using the PSIP protocol). Content 102 may be streaming content received from a server over a network (*e.g.*, the Internet)
30 and may include metadata in packet headers.

[0038] At 604, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) determines whether the content 102 includes subtitles in the second language. For example, media access and playback circuitry 402 retrieves, extracts, or otherwise analyzes the metadata of the content 102 for a field, flag, or other indicator of languages in which subtitles are
5 available. If subtitles are available in the second language, processing proceeds to step 612. If subtitles are not available in the second language, then, at 606, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) determines whether any subtitles are available, for example, in the first language. If subtitles are available, then, at 610, control circuitry 400 translates the subtitle text from the first language to the second language using methods
10 described above in reference to FIG. 5 to generate subtitles in the second language.

[0039] At 612, control circuitry 400 (*e.g.*, using video output circuitry 404) outputs for display the subtitles in the second language.

[0040] The actions or descriptions of FIG. 6 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in relation to FIG. 6 may be done
15 in suitable alternative orders or in parallel to further the purposes of this disclosure.

[0041] FIG. 7 is a flowchart representing an illustrative process for generating translated dialogue for audio output in accordance with some embodiments of the disclosure. The flowchart in FIG. 7 represents a process 700 implemented on control circuitry 400 for generating translated dialogue for audio output according to an embodiment of the disclosure. In addition,
20 one or more actions of process 700 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0042] At 702, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) accesses metadata of the content 102. This may be accomplished using methods described above in reference to FIG. 6.

[0043] At 704, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) determines if audio data is available in the second language. For example, media access and playback circuitry 402 retrieves, extracts, or otherwise analyzes the metadata of the content 102 for a field, flag, or other indicator of languages in which audio data is available. For example, the content 102 may contain multiple audio tracks, each comprising dialogue in a different
25 language. Such alternate audio tracks may be included using the Secondary Audio Protocol or may be separate audio streams to which pointers are embedded in the content 102. For example,
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content 102 may be received as part of an MPEG-2 transport stream comprising a video stream and a plurality of audio streams corresponding to the content 102. The MPEG-2 transport stream also contains metadata, such as program-specific information (*e.g.*, using the PSIP protocol) which identifies each video and audio stream contained within the MPEG-2 transport stream.

5 Such metadata may identify a language of each audio stream corresponding to the content 102. If audio data is available in the second language, processing proceeds to step 714. If audio data is not available in the second language, then, at 706, control circuitry 400 (*e.g.*, using media access and playback circuitry 402) accesses audio data associated with the portion of the content dialogue. For example, media access and playback circuitry 402 extracts, retrieves, or otherwise
10 copies the audio data of the content 102 from a playback time at which the portion of the content dialogue begins to a second playback time at which the portion of the content dialogue ends. In some cases, where multiple characters speak at the same time, control circuitry 400 uses frequency filtering or other audio processing techniques to capture only the portion of the content dialogue to be translated.

15 [0044] At 708, control circuitry 400 (*e.g.*, using language processing circuitry 416) transcribes the audio data associated with the portion of the content dialogue into text of the first language. This may be accomplished using methods described above in reference to FIG. 5.

[0045] At 710, control circuitry 400 (*e.g.*, using language processing circuitry 416) translates the text of the first language into text of the second language. This may be accomplished using
20 methods described above in reference to FIG. 5.

[0046] At 712, control circuitry 400 (*e.g.*, using language processing circuitry 416) generates synthesized speech from the text of the second language. This may be accomplished using concatenation synthesis, such as unit selection synthesis, diphone synthesis, or domain-specific synthesis, formant synthesis, articulatory synthesis, hidden Markov models-based (HMM)
25 synthesis, sinewave synthesis, or any other suitable speech synthesis technique.

[0047] At 714, control circuitry 400 (*e.g.*, using audio output circuitry 406) outputs the audio of the content dialogue in the second language.

[0048] It is contemplated that the actions or descriptions of FIG. 7 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in
30 relation to FIG. 7 may be done in alternative orders or in parallel to further the purposes of this disclosure.

[0049] FIG. 8 is a flowchart representing an illustrative process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the disclosure. The flowchart in FIG. 8 represents a process 800 implemented on control circuitry 400 for determining a portion of the dialogue to repeat in an alternate language according to an embodiment of the disclosure. In addition, one or more actions of process 800 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0050] At 802, control circuitry 400 (*e.g.*, using input circuitry 412) receives a voice command from a user to repeat a portion of the content dialogue. For example, microphone 408 may capture a vocal utterance of the user and transfer audio data corresponding to the captured vocal utterance to input circuitry 412. Input circuitry 412 processes the captured vocal utterance and determines that the user wishes to repeat a portion of the content dialogue.

[0051] At 804, control circuitry 400 identifies a first time at which the voice command was received. In response to receiving the voice command, control circuitry 400 may access a real-time clock and store the time at which the command was received. Alternatively, when transferring the captured vocal utterance to input circuitry 412, microphone 408 may include a header or other metadata in which microphone 408 includes the time at which microphone 408 captured the vocal utterance.

[0052] At 806, control circuitry 400 determines a duration of the voice command. Control circuitry 400 processes the audio data corresponding to the vocal utterance and determine a duration of the captured vocal utterance. Alternatively, as above, microphone 408 may include in a header an indication of the duration of the vocal utterance.

[0053] At 808, control circuitry 400 calculates a second time at which the command began based on the first time and the duration. Control circuitry 400 converts the first time into an integer. For example, control circuitry 400 converts the first time into a UTC integer representing a number of seconds which have elapsed since January 1, 1970. Control circuitry 400 subtracts the duration of the voice command from the integer representing the first time to calculate an integer representing the second time. Control circuitry 400 may convert the integer representing the second time to another time format, such as HH:MM:SS, and/or may convert the second time to a relative playback time of the content 102.

[0054] At 810, control circuitry 400 determines if any portion of the content dialogue is in progress at the second time. Control circuitry 400 (*e.g.*, using media access and playback circuitry 412) may access audio data of the content 102 to determine if any character is speaking during the second time. Alternatively or additionally, media access playback circuitry 412 may access video data of the content 102 and analyze character facial movements to determine if any character is speaking at the second time. Then, at 812, control circuitry 400 identifies a portion of the content dialogue in progress at the second time.

[0055] It is contemplated that the actions or descriptions of FIG. 8 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in relation to FIG. 8 may be done in alternative orders or in parallel to further the purposes of this disclosure.

[0056] FIG. 9 is a flowchart representing another illustrative process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the disclosure. The flowchart in FIG. 9 represents another process 900 implemented on control circuitry 400 for determining a portion of the dialogue to repeat in an alternate language according to an embodiment of the disclosure. In addition, one or more actions of process 900 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0057] At 902, control circuitry 400 receives a voice command to repeat a portion of the content dialogue. This may be accomplished using methods described above in reference to FIG. 8.

[0058] At 904, control circuitry 400 identifies a time T_{cmd} at which the voice command was received. This may be accomplished using methods described above in reference to FIG. 8.

[0059] At 906, control circuitry 400 identifies a portion P of the content 102 from a predefined amount of time prior to T_{cmd} through T_{cmd} and, at 908, identifies a plurality of portions of the content dialogue that are in spoken during period P. This may be accomplished using methods described above in reference to FIG. 8.

[0060] At 910, control circuitry 400 captures a first portion of dialogue D spoken during period P. This may be accomplished using methods described above in reference to FIG. 8.

[0061] At 912, control circuitry 400 identifies an accent in which the dialogue of portion D is spoken. This may be accomplished using methods described in U.S. Patent No. 9,854,324, which is owned by Applicant and is incorporated herein by reference.

[0062] At 914, control circuitry 400 determines whether there are any additional portions of the content dialogue in the plurality of portions of the content dialogue. If so, then, at 916, control circuitry 400 captures the next portion and processing returns to step 912, at which control circuitry 400 identifies an accent with which the portion was spoken.

[0063] If there are no additional portions, then, at 918, control circuitry 400 begins again at the first portion of the plurality of portions and, at 920, determines whether the accent with which the portion was spoken is different than the accents with which a majority of the remainder of the portions were spoken. If the accent is not different than that of the majority of the remainder of the portions, then, at 922, control circuitry moves to the next portion in the plurality of portions and processing returns to step 920.

[0064] If the accent of the portion is different than that of the majority of the remainder of the portions, then, at 924, control circuitry 400 selects the current portion D for translation.

[0065] It is contemplated that the actions or descriptions of FIG. 9 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in relation to FIG. 9 may be done in alternative orders or in parallel to further the purposes of this disclosure.

[0066] FIG. 10 is a flowchart representing a third illustrative process for determining a portion of the dialogue to repeat in an alternate language in accordance with some embodiments of the disclosure. The flowchart in FIG. 10 represents a third process 1000 implemented on control circuitry 400 for determining a portion of the dialogue to repeat in an alternate language according to an embodiment of the disclosure. In addition, one or more actions of process 1000 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0067] At 1002, control circuitry 400 (*e.g.*, using input circuitry 412) receives a voice command to repeat a portion of the content dialogue. This may be accomplished using methods described above in reference to FIG. 8.

[0068] At 1004, control circuitry 400 identifies a time T_{cmd} at which the voice command was received. This may be accomplished using methods described above in reference to FIG. 8.

[0069] At 1006, control circuitry 400 identifies a portion P of the content 102 from a predefined amount of time prior to T_{cmd} through T_{cmd} and, at 1008, identifies a plurality of portions of the content dialogue that are in spoken during period P. This may be accomplished using methods described above in reference to FIG. 8.

5 [0070] At 1010, control circuitry 400 captures a first portion of dialogue D spoken during period P. This may be accomplished using methods described above in reference to FIG. 8.

[0071] At 1012, control circuitry 400 (*e.g.*, using language processing circuitry 416) determines a word count for portion D. Language processing circuitry 416 may transcribe portion D to obtain a word count. Alternatively, language processing circuitry 416 may perform
10 audio analysis on the dialogue of portion D to obtain a word count. For example, language processing circuitry 416 may track the frequency of a speaking voice to identify the speaker's phrasing, intonation, and cadence. Language processing circuitry 416 then determines specific points within the audio data of portion D at which the identified phrasing, intonation, and cadence indicate that the speaker has spoken a complete word.

15 [0072] At 1014, control circuitry 400 determines a duration of portion D. Control circuitry 400 (*e.g.*, using media access and playback circuitry 402) determines a playback time at which portion D begins and a playback time at which portion D ends. Control circuitry 400 may convert the beginning and end times to respective integers. Control circuitry 400 subtracts the end time from the beginning time to calculate a duration of portion D.

20 [0073] At 1016, control circuitry 400 determines whether additional portions of dialogue are identified during period P. If additional portions are identified, then, at 1018, control circuitry 400 captures the next portion, and processing returns to step 1012, at which control circuitry 400 determines a word count for the next portion.

[0074] If no additional portions are identified during period P, then, at 1020, control
25 circuitry 400 determines a particular portion having the highest word count and the shortest duration. Control circuitry 400 sorts the identified portions, first by word count in descending order (*i.e.*, highest count first), and then by duration in ascending order (*i.e.*, shortest duration first). Control circuitry 400 then determines the portion having the highest number of words in the shortest amount of time.

30 [0075] It is contemplated that the actions or descriptions of FIG. 10 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in

relation to FIG. 10 may be done in alternative orders or in parallel to further the purposes of this disclosure.

[0076] FIG. 11 is a flowchart representing an illustrative process for identifying an alternate language in accordance with some embodiments of the disclosure. The flowchart in FIG. 11 represents a process 1100 implemented on control circuitry 400 for identifying an alternate language according to an embodiment of the disclosure. In addition, one or more actions of process 1100 may be incorporated into or combined with one or more actions of any other process or embodiment described herein.

[0077] At 1102, control circuitry 400 (*e.g.*, using language processing circuitry 416) transcribes a random portion of the content dialogue into text of the first language. This may be accomplished using methods described above in reference to FIG. 7.

[0078] At 1104, control circuitry 400 (*e.g.*, using language processing circuitry 416) compares at least a first word of the transcribed text with a language database. The language database returns an identifier of each language in which the first word appears. At 1106, control circuitry 400 determines whether the word is found in more than one language. For example, the database returns an identifier of each language in which the word is found. If the word is found in more than one language, then, at 1108 control circuitry 400 compares a second word of the transcribed text with the language database, and processing returns to step 1106, at which control circuitry 400 determines whether the word is found in more than one language. If the word is only found in one language, then, at 1110, control circuitry 400 selects the language in which the word is found as the first language.

[0079] It is contemplated that the actions or descriptions of FIG. 11 may be used with any other embodiment of this disclosure. In addition, the actions and descriptions described in relation to FIG. 11 may be done in alternative orders or in parallel to further the purposes of this disclosure.

[0080] The processes described above are intended to be illustrative and not limiting. One skilled in the art would appreciate that the steps of the processes discussed herein may be omitted, modified, combined, and/or rearranged, and any additional steps may be performed without departing from the scope of the invention. More generally, the above disclosure is meant to be exemplary and not limiting. Only the claims that follow are meant to set bounds as to what the present invention includes. Furthermore, it should be noted that the features and

limitations described in any one embodiment may be applied to any other embodiment herein, and flowcharts or examples relating to one embodiment may be combined with any other embodiment in a suitable manner, done in different orders, or done in parallel. In addition, the systems and methods described herein may be performed in real time. It should also be noted
5 that the systems and/or methods described above may be applied to, or used in accordance with, other systems and/or methods.

What is Claimed is:

1. A method for replaying content dialogue in an alternate language, the method comprising:

detecting a first language in which the content dialogue is spoken;
receiving, from a user input device, a command to repeat a portion of the content

5 dialogue; and

in response to receiving the command:

identifying a second language in which the command was spoken;
determining the portion of the content dialogue to repeat;
translating the portion of the content dialogue from the first language to the

10 second language; and

outputting the translated dialogue.

2. The method of claim 1, wherein:

translating the portion of the content dialogue comprises:

accessing subtitle text associated with the portion of the content dialogue; and
translating the subtitle text into the second language; and

5 outputting the translated dialogue comprises generating for display the translated subtitle text.

3. The method of claim 1, wherein:

translating the portion of the content dialogue comprises:

accessing audio data associated with the portion of the content dialogue;
transcribing the audio into text of the first language; and

5 translating the text of the first language into text of the second language; and

outputting the translated dialogue comprises generating and outputting speech
synthesized from the text of the second language.

4. The method of claim 1, wherein determining the portion of the content dialogue to repeat comprises:

identifying a first time at which the command was received;

determining a duration of the command;

5 calculating a second time at which input of the command began based on the first time
and the duration; and

identifying a portion of the content dialogue in progress at the second time.

5. The method of claim 1, wherein determining the portion of the content dialogue to repeat
comprises:

identifying a time at which the command was received;

5 identifying a plurality of portions of the content dialogue within a predefined amount of
time prior to the time;

determining an accent in each portion of the content dialogue in the plurality of portions
of the content dialogue; and

10 selecting a portion of the content dialogue in the plurality of portions of the content
dialogue having an accent different from an accent of at least one other portion of the content
dialogue.

6. The method of claim 1, wherein determining the portion of the content dialogue to repeat
comprises:

identifying a time at which the command was received;

5 identifying a plurality of portions of the content dialogue within a predefined amount of
time prior to the time;

determining a word count for each portion of the content dialogue in the plurality of
portions of the content dialogue;

determining a duration for each portion of the content dialogue in the plurality of portions
of the content dialogue; and

10 determining a particular portion of the content dialogue having the highest word count
and the shortest duration.

7. The method of claim 1, wherein detecting the first language in which the content
dialogue is spoken comprises:

transcribing a portion of the content dialogue into text of the first language; and

comparing at least a first word of the text of the first language with a database of
5 languages.

8. A system for replaying content dialogue in an alternate language, the system comprising:
input circuitry configured to receive, from a user input device, a command to repeat a
portion of the content dialogue; and

control circuitry configured to:

5 determine the portion of the dialogue to repeat;
detect a first language in which the content dialogue is spoken;
identify a second language in which the command was spoken;
translate the portion of the content dialogue from the first language to the second
language; and

10 output the translated dialogue.

9. The system of claim 8, wherein:

the control circuitry configured to translate the portion of the content dialogue is
configured to:

access subtitle text associated with the portion of the content dialogue; and
5 translate the subtitle text into the second language; and

the control circuitry configured to output the translated dialogue is configured to generate
for display the translated subtitle text.

10. The system of claim 8, wherein:

the control circuitry configured to translate the portion of the content dialogue is
configured to:

access audio data associated with the portion of the content dialogue;
5 transcribe the audio into text of the first language; and
translate the text of the first language into text of the second language; and

the control circuitry configured to output the translated dialogue is configured to generate
and outputting speech synthesized from the text of the second language.

11. The system of claim 8, wherein the control circuitry configured to determine the portion of the content dialogue to repeat is configured to:

identify a first time at which the command was received;

determine a duration of the command;

5 calculate a second time at which input of the command began based on the first time and the duration; and

identify a portion of the content dialogue in progress at the second time.

12. The system of claim 8, wherein the control circuitry configured to determine the portion of the content dialogue to repeat is configured to:

identify a time at which the command was received;

5 identify a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

determine an accent in each portion of the content dialogue in the plurality of portions of the content dialogue; and

select a portion of the content dialogue in the plurality of portions of the content dialogue having an accent different from an accent of at least one other portion of the content dialogue.

13. The system of claim 8, wherein the control circuitry configured to determine the portion of the content dialogue to repeat is configured to:

identify a time at which the command was received;

5 identify a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

determine a word count for each portion of the content dialogue in the plurality of portions of the content dialogue;

determine a duration for each portion of the content dialogue in the plurality of portions of the content dialogue; and

10 determine a particular portion of the content dialogue having the highest word count and the shortest duration.

14. The system of claim 8, wherein the control circuitry configured to detect the first language in which the content dialogue is spoken is configured to:
transcribe a portion of the content dialogue into text of the first language; and
compare at least a first word of the text of the first language with a database of languages.

15. A system for replaying content dialogue in an alternate language, the system comprising:
means for detecting a first language in which the content dialogue is spoken;
means for receiving, from a user input device, a command to repeat a portion of the content dialogue; and

5 means for, in response to receiving the command:
identifying a second language in which the command was spoken;
determining the portion of the content dialogue to repeat;
translating the portion of the content dialogue from the first language to the
second language; and
10 outputting the translated dialogue.

16. The system of claim 15, wherein:
the means for translating the portion of the content dialogue comprises:
means for accessing subtitle text associated with the portion of the content
dialogue; and
5 means for translating the subtitle text into the second language; and
the means for outputting the translated dialogue comprises means for generating for
display the translated subtitle text.

17. The system of claim 15, wherein:
the means for translating the portion of the content dialogue comprises:
means for accessing audio data associated with the portion of the content
dialogue;
5 means for transcribing the audio into text of the first language; and
means for translating the text of the first language into text of the second
language; and

the means for outputting the translated dialogue comprises means for generating and outputting speech synthesized from the text of the second language.

18. The system of claim 15, wherein the means for determining the portion of the content dialogue to repeat comprises:

means for identifying a first time at which the command was received;

means for determining a duration of the command;

5 means for calculating a second time at which input of the command began based on the first time and the duration; and

means for identifying a portion of the content dialogue in progress at the second time.

19. The system of claim 15, wherein the means for determining the portion of the content dialogue to repeat comprises:

means for identifying a time at which the command was received;

5 means for identifying a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

means for determining an accent in each portion of the content dialogue in the plurality of portions of the content dialogue; and

10 means for selecting a portion of the content dialogue in the plurality of portions of the content dialogue having an accent different from an accent of at least one other portion of the content dialogue.

20. The system of claim 15, wherein the means for determining the portion of the content dialogue to repeat comprises:

means for identifying a time at which the command was received;

5 means for identifying a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

means for determining a word count for each portion of the content dialogue in the plurality of portions of the content dialogue;

means for determining a duration for each portion of the content dialogue in the plurality of portions of the content dialogue; and

10 means for determining a particular portion of the content dialogue having the highest word count and the shortest duration.

21. The system of claim 15, wherein the means for detecting the first language in which the content dialogue is spoken comprises:

means for transcribing a portion of the content dialogue into text of the first language;
and

5 means for comparing at least a first word of the text of the first language with a database of languages.

22. A non-transitory computer-readable medium having instructions encoded thereon for replaying content dialogue in an alternate language that, when executed by control circuitry, causes the control circuitry to:

detect a first language in which the content dialogue is spoken;

5 receive, from a user input device, a command to repeat a portion of the content dialogue;
and

in response to receiving the command:

identify a second language in which the command was spoken;

determine the portion of the content dialogue to repeat;

10 translate the portion of the content dialogue from the first language to the second language; and

output the translated dialogue.

23. The non-transitory computer-readable medium of claim 22, wherein:

execution of the instruction to translate the portion of the content dialogue causes the control circuitry to:

access subtitle text associated with the portion of the content dialogue; and

5 translate the subtitle text into the second language; and

execution of the instruction to output the translated dialogue causes the control circuitry to generate for display the translated subtitle text.

24. The non-transitory computer-readable medium of claim 22, wherein:
execution of the instruction to translate the portion of the content dialogue causes the
control circuitry to:

access audio data associated with the portion of the content dialogue;

5 transcribe the audio into text of the first language; and

translate the text of the first language into text of the second language; and

execution of the instruction to output the translated dialogue causes the control circuitry
to generate and outputting speech synthesized from the text of the second language.

25. The non-transitory computer-readable medium of claim 22, wherein execution of the
instruction to determine the portion of the content dialogue to repeat causes the control circuitry
to:

identify a first time at which the command was received;

5 determine a duration of the command;

calculate a second time at which input of the command began based on the first time and
the duration; and

identify a portion of the content dialogue in progress at the second time.

26. The non-transitory computer-readable medium of claim 22, wherein execution of the
instruction to determine the portion of the content dialogue to repeat causes the control circuitry
to:

identify a time at which the command was received;

5 identify a plurality of portions of the content dialogue within a predefined amount of time
prior to the time;

determine an accent in each portion of the content dialogue in the plurality of portions of
the content dialogue; and

select a portion of the content dialogue in the plurality of portions of the content dialogue

10 having an accent different from an accent of at least one other portion of the content dialogue.

27. The non-transitory computer-readable medium of claim 22, wherein execution of the instruction to determine the portion of the content dialogue to repeat causes the control circuitry to:

identify a time at which the command was received;

5 identify a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

determine a word count for each portion of the content dialogue in the plurality of portions of the content dialogue;

10 determine a duration for each portion of the content dialogue in the plurality of portions of the content dialogue; and

determine a particular portion of the content dialogue having the highest word count and the shortest duration.

28. The non-transitory computer-readable medium of claim 22, wherein execution of the instruction to detect the first language in which the content dialogue is spoken causes the control circuitry to:

transcribe a portion of the content dialogue into text of the first language; and

5 compare at least a first word of the text of the first language with a database of languages.

29. A method for replaying content dialogue in an alternate language, the method comprising:

playing back the content;

detecting a first language in which the content dialogue is spoken;

5 receiving, from a user input device, a command to repeat a portion of the content dialogue;

in response to receiving the command:

identifying a second language in which the command was spoken;

determining the portion of the content dialogue to repeat;

10 translating the portion of the content dialogue from the first language to the second language; and

outputting the translated dialogue.

30. The method of claim 29, wherein:

translating the portion of the content dialogue comprises:

accessing subtitle text associated with the portion of the content dialogue; and

translating the subtitle text into the second language; and

5 outputting the translated dialogue comprises generating for display the translated subtitle text.

31. The method of claim 29, wherein:

translating the portion of the content dialogue comprises:

accessing audio data associated with the portion of the content dialogue;

transcribing the audio into text of the first language; and

5 translating the text of the first language into text of the second language; and
outputting the translated dialogue comprises generating and outputting speech
synthesized from the text of the second language.

32. The method of any of claims 29-31, wherein determining the portion of the content dialogue to repeat comprises:

identifying a first time at which the command was received;

determining a duration of the command;

5 calculating a second time at which input of the command began based on the first time
and the duration; and

identifying a portion of the content dialogue in progress at the second time.

33. The method of any of claims 29-31, wherein determining the portion of the content dialogue to repeat comprises:

identifying a time at which the command was received;

5 identifying a plurality of portions of the content dialogue within a predefined amount of
time prior to the time;

determining an accent in each portion of the content dialogue in the plurality of portions
of the content dialogue; and

10 selecting a portion of the content dialogue in the plurality of portions of the content dialogue having an accent different from an accent of at least one other portion of the content dialogue.

34. The method of any of claims 29-31, wherein determining the portion of the content dialogue to repeat comprises:

5 identifying a time at which the command was received;
identifying a plurality of portions of the content dialogue within a predefined amount of time prior to the time;

determining a word count for each portion of the content dialogue in the plurality of portions of the content dialogue;

determining a duration for each portion of the content dialogue in the plurality of portions of the content dialogue; and

10 determining a particular portion of the content dialogue having the highest word count and the shortest duration.

35. The method of any of claims 29-34, wherein detecting the first language in which the content dialogue is spoken comprises:

transcribing a portion of the content dialogue into text of the first language; and
5 comparing at least a first word of the text of the first language with a database of languages.

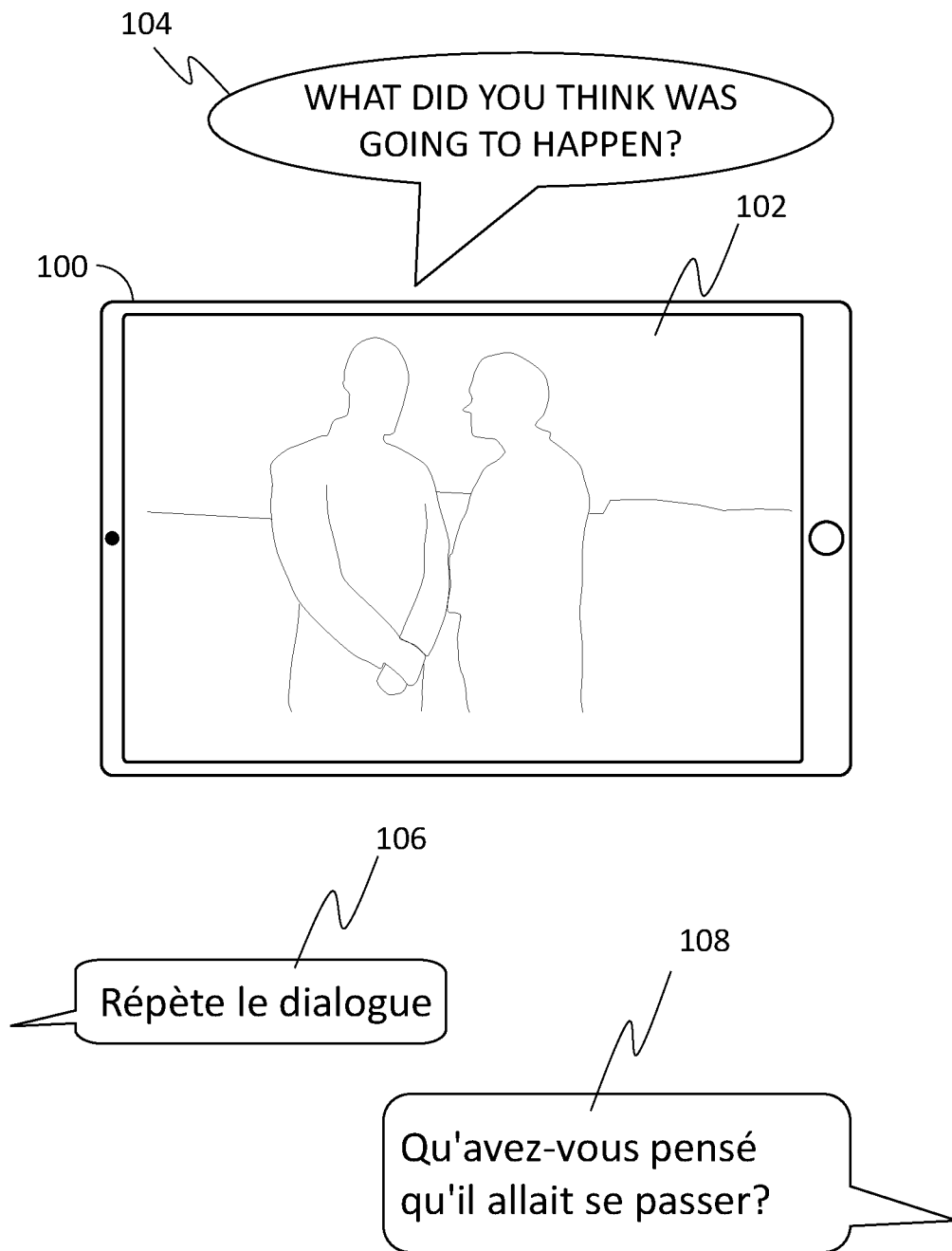


FIG. 1

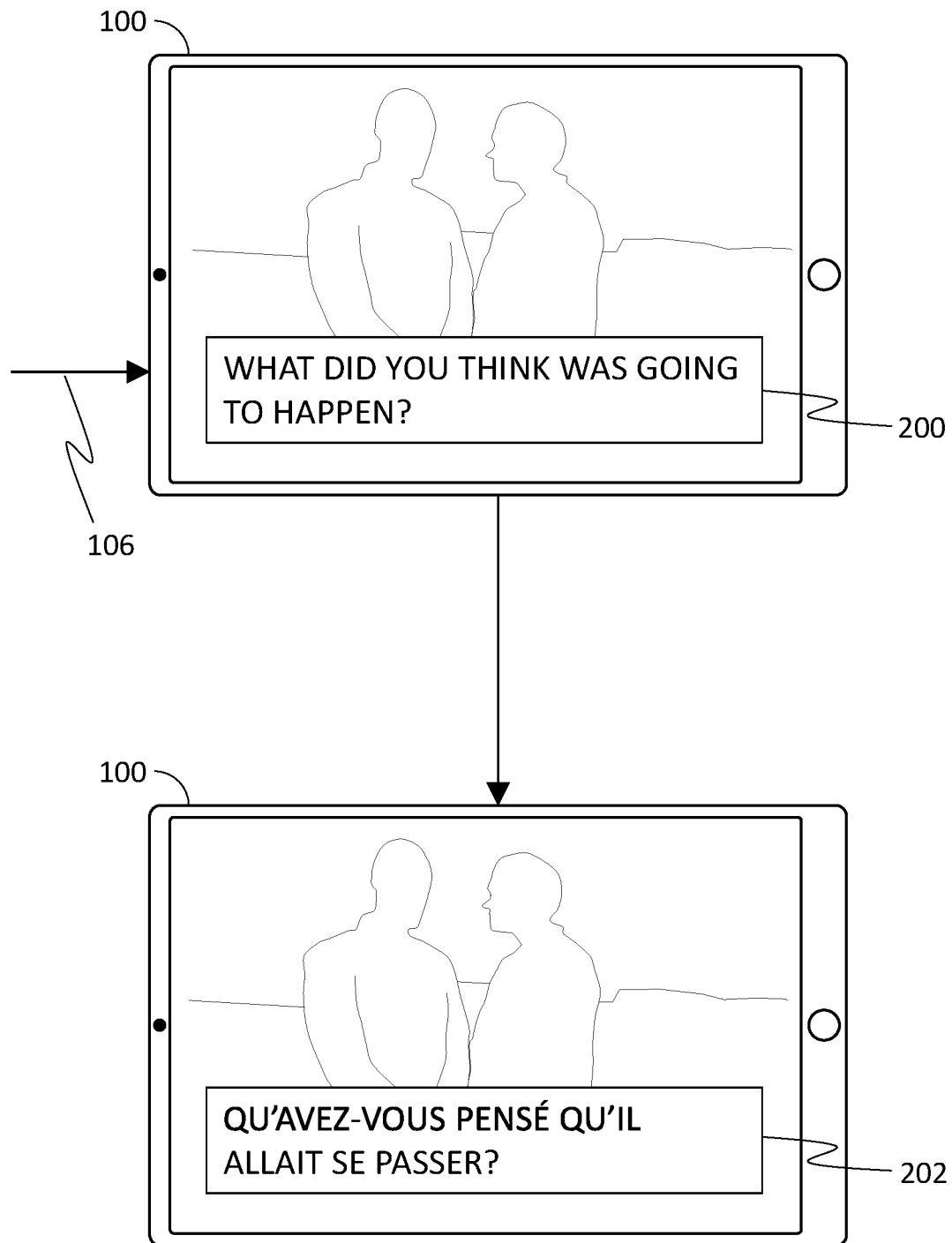


FIG. 2

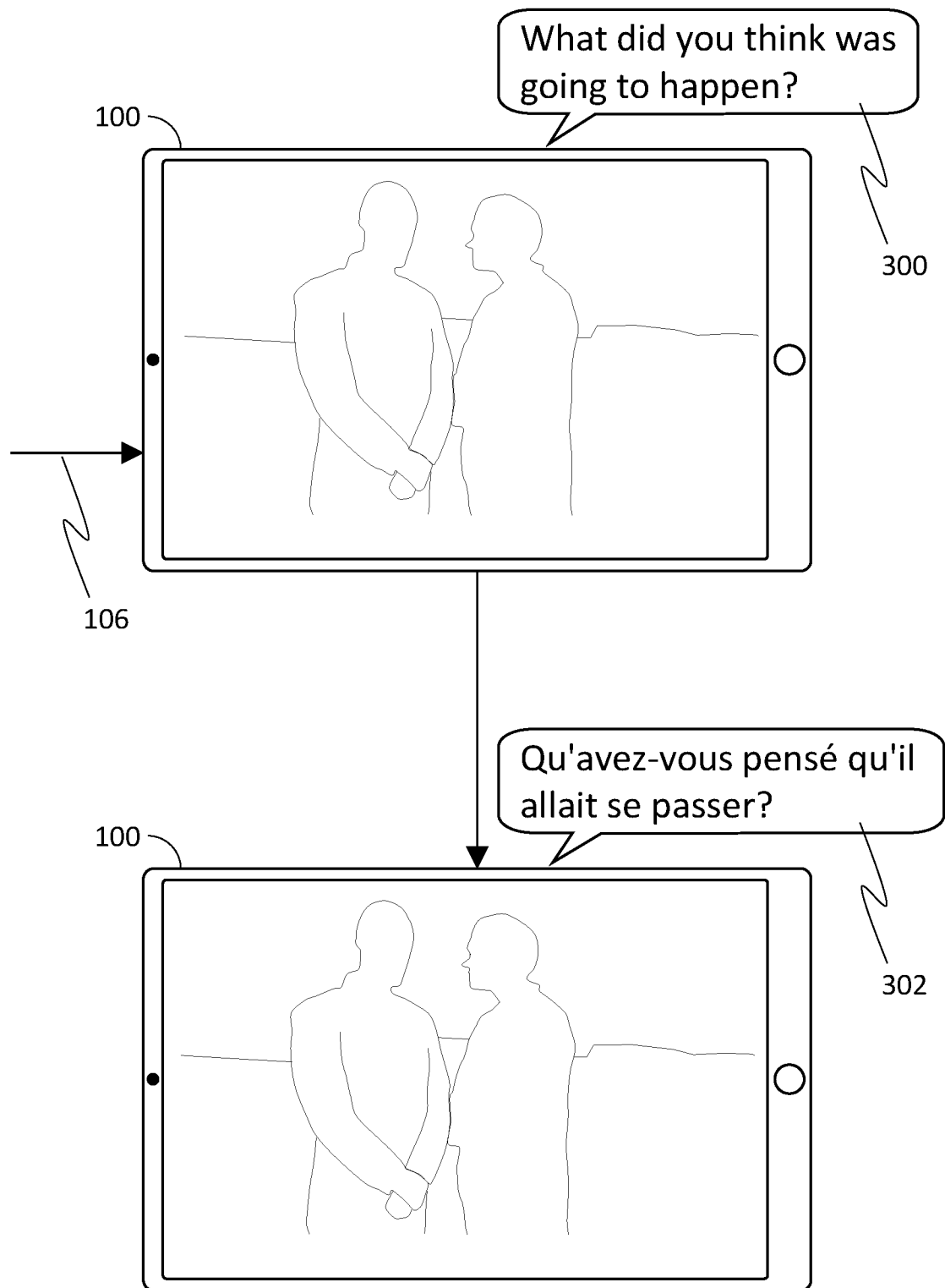


FIG. 3

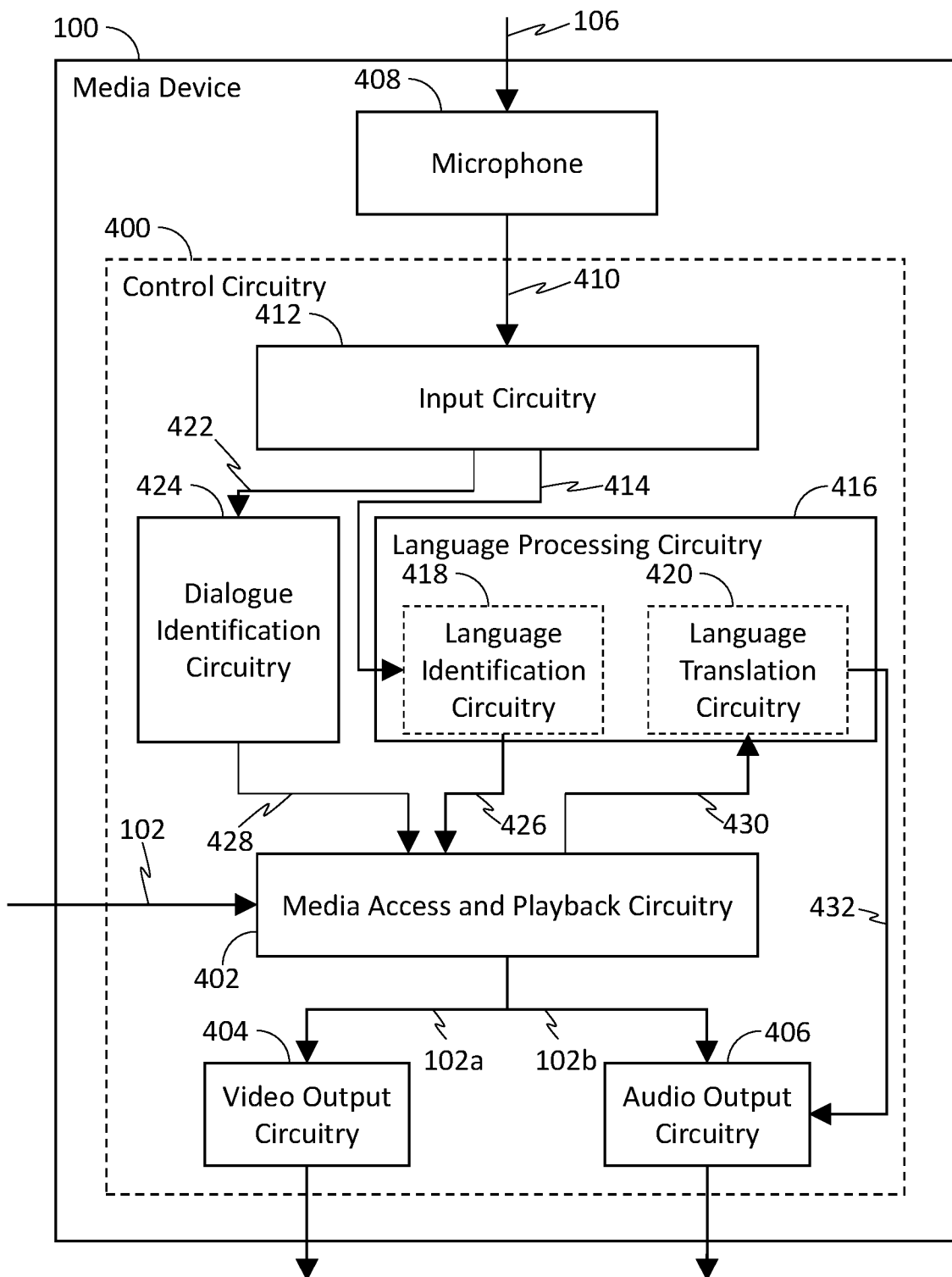
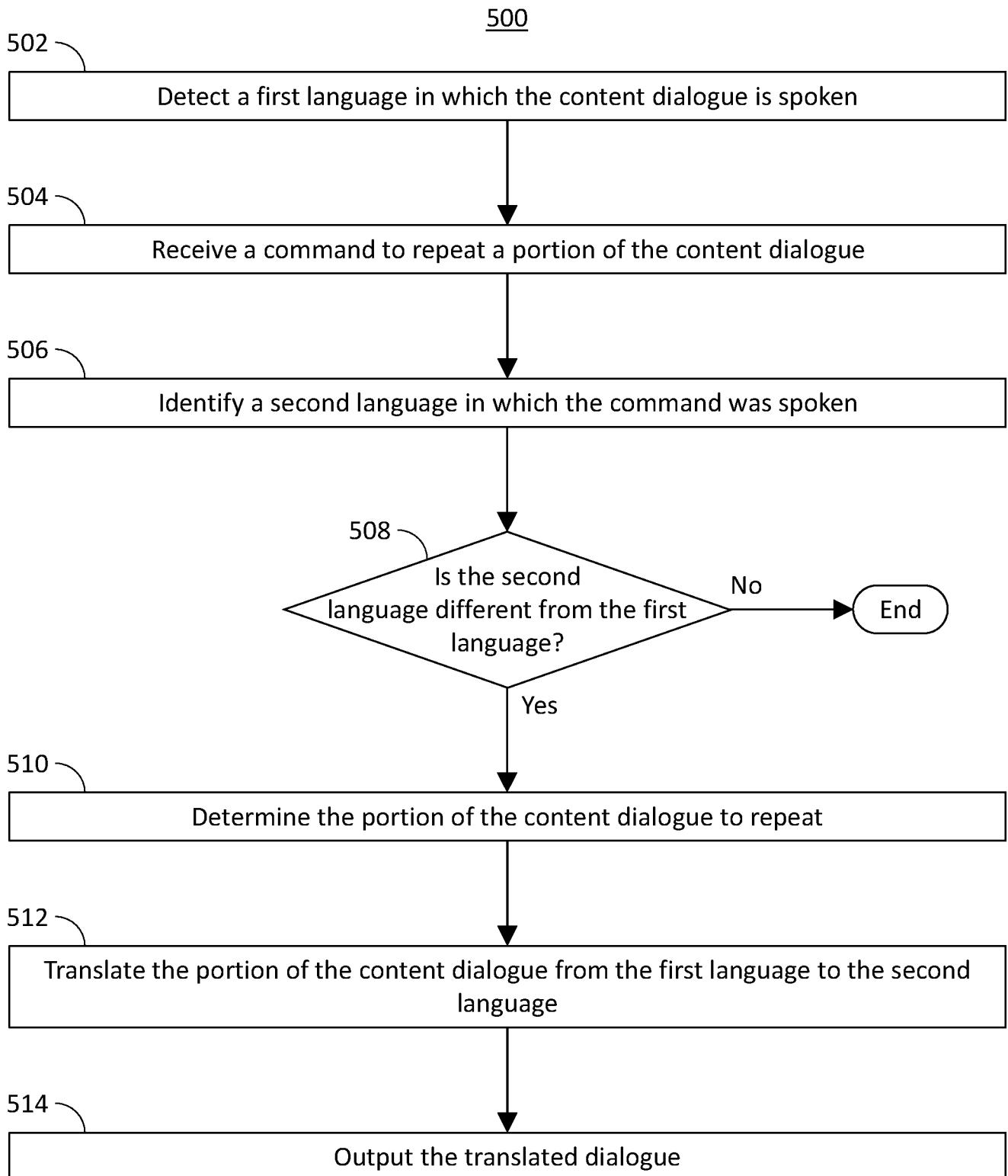
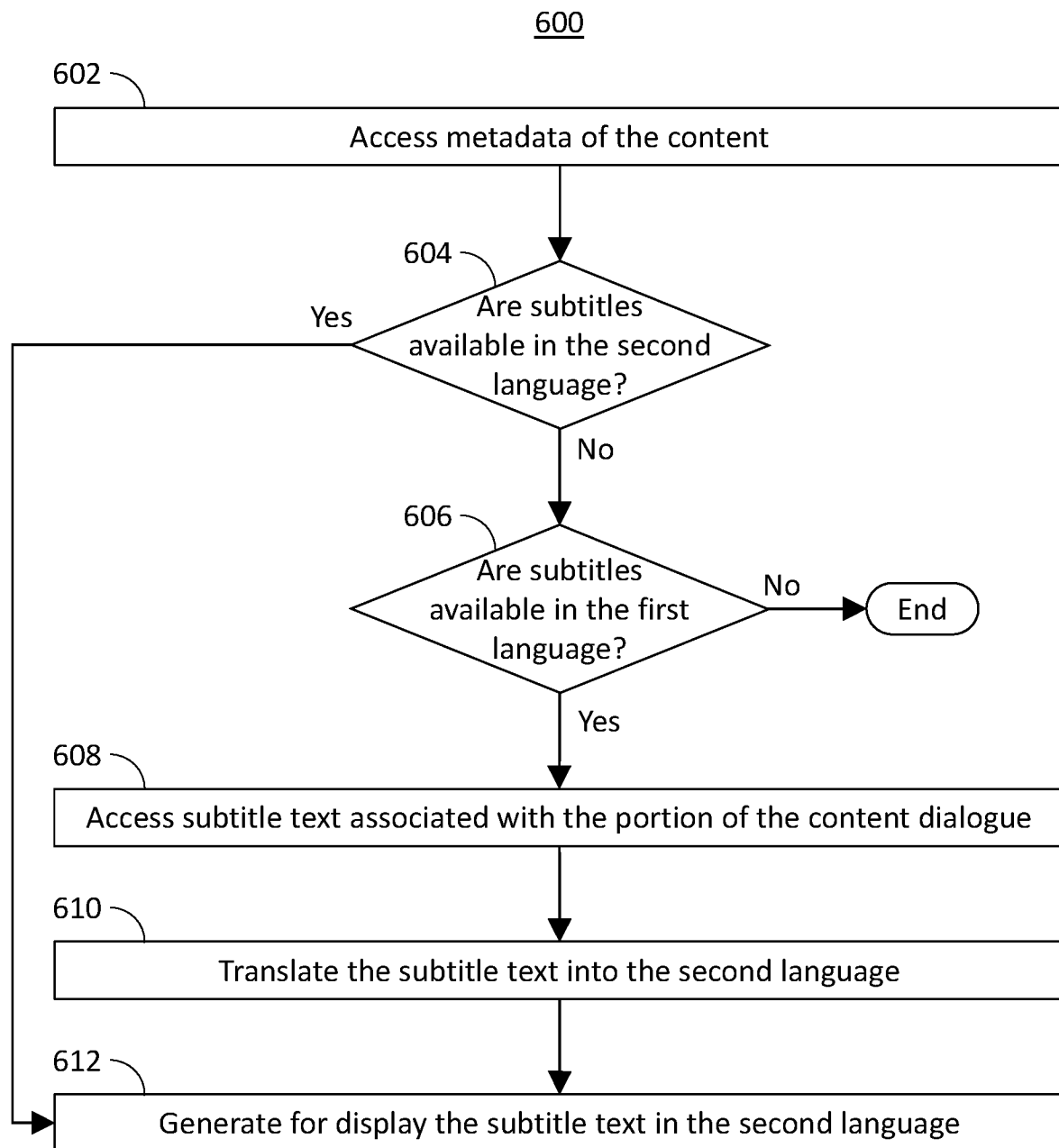
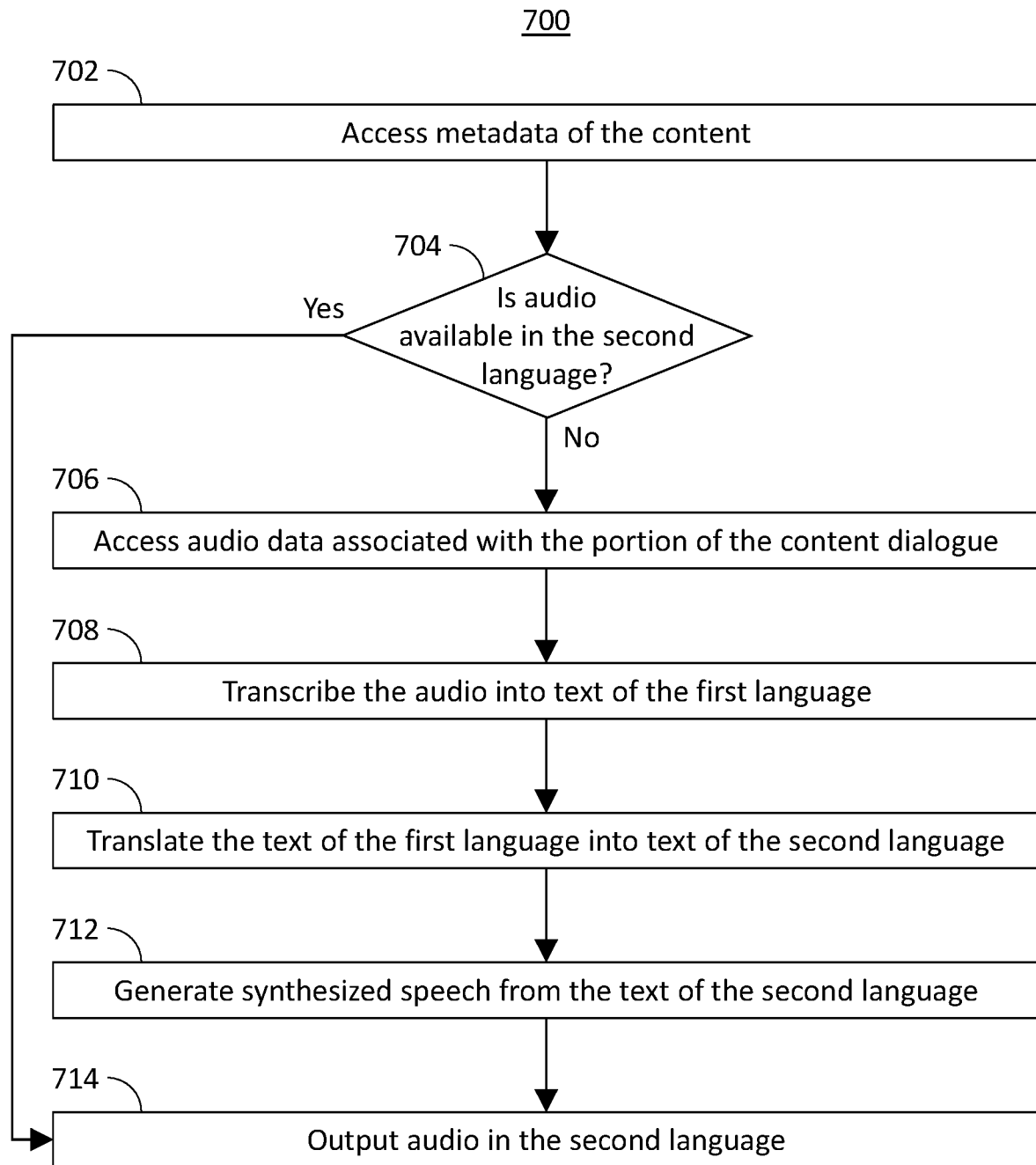
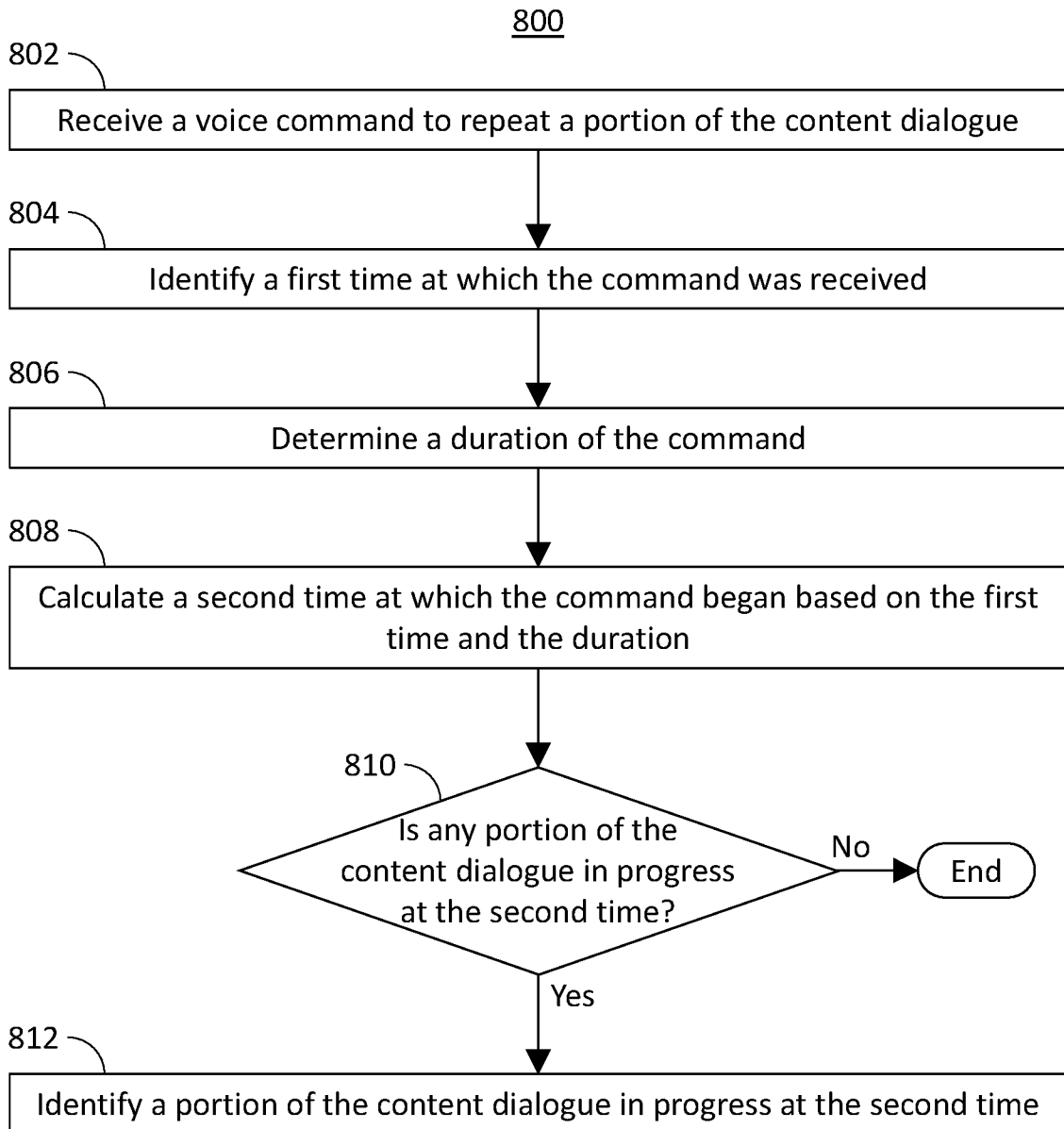


FIG. 4

**FIG. 5**

**FIG. 6**

**FIG. 7**

**FIG. 8**

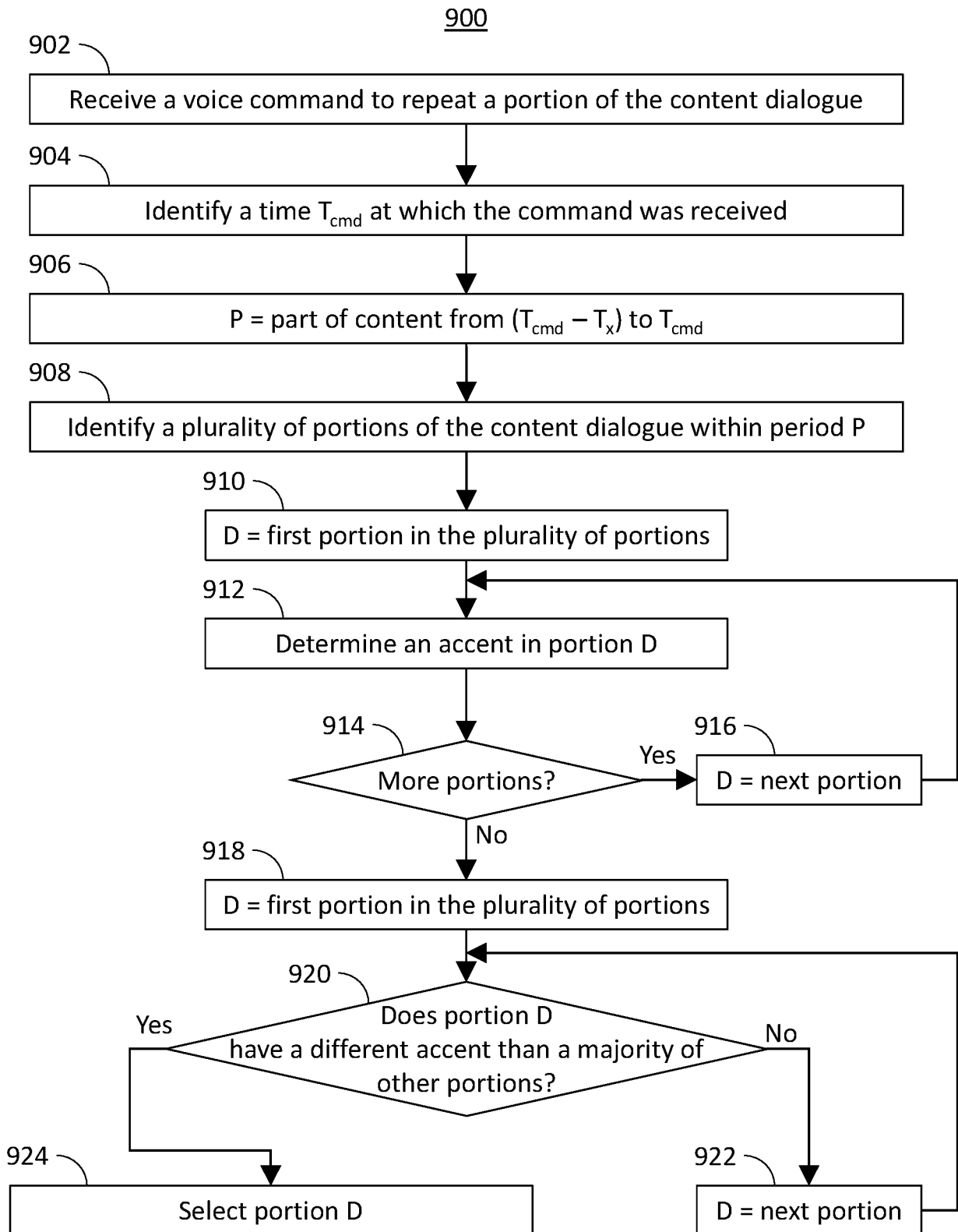


FIG. 9

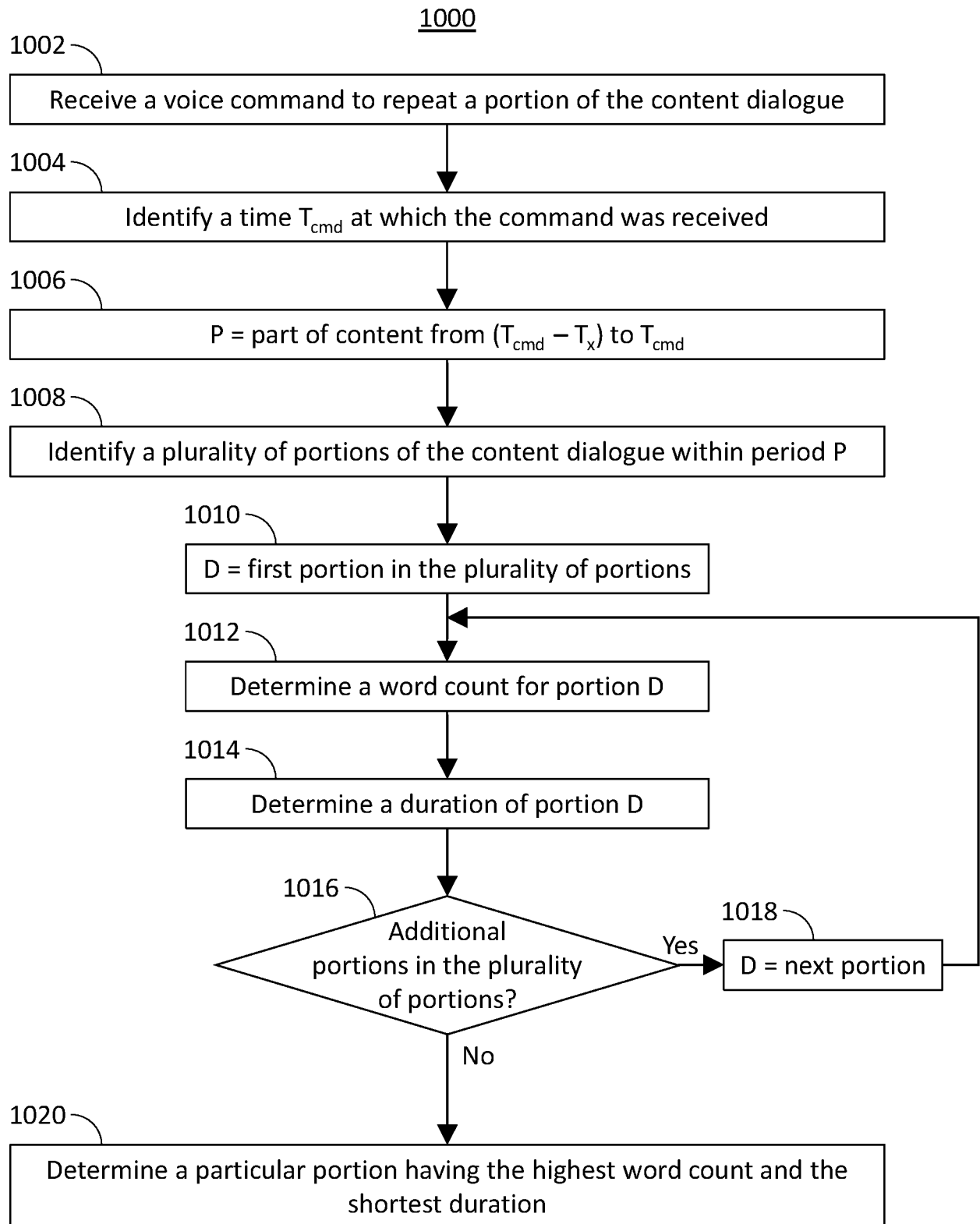
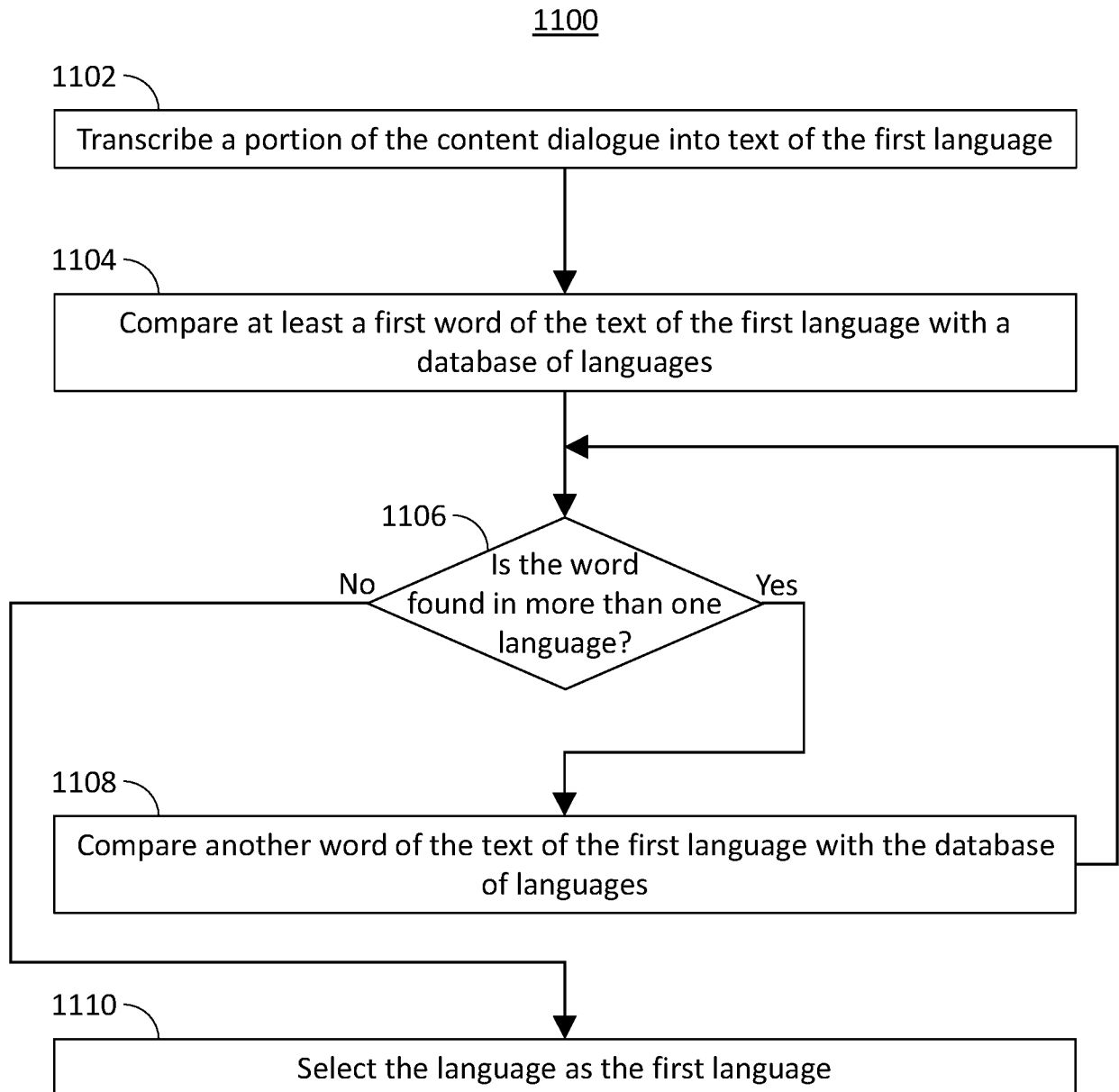


FIG. 10

**FIG. 11**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/055911

A. CLASSIFICATION OF SUBJECT MATTER
INV. G10L15/22 G10L13/08
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G10L

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 2012/035907 A1 (LEBEAU MICHAEL J [US] ET AL) 9 February 2012 (2012-02-09) abstract; figures 1-10 paragraphs [0027] - [0066]	1,8,15, 22,29 2,9,16, 23,30 3-7, 10-14, 17-21, 24-28, 31-35
X A	----- US 2002/120436 A1 (MIZUTANI KENJI [JP] ET AL) 29 August 2002 (2002-08-29) abstract; figures 1-5, 12-25 paragraphs [0007] - [0027] paragraphs [0180] - [0218] ----- -/-	1,8,15, 22,29 2-7, 9-14, 16-21, 23-28, 30-35



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

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

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

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

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

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

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Date of the actual completion of the international search

21 January 2020

Date of mailing of the international search report

29/01/2020

Name and mailing address of the ISA/

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Authorized officer

Képesi, Marián

INTERNATIONAL SEARCH REPORT

International application No

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