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Korn

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(54) **AUDIBLY INDICATING SECONDARY CONTENT WITH SPOKEN TEXT**

(71) Applicant: **Amazon Technologies, Inc.**, Seattle, WA (US)

(72) Inventor: **Peter Alex Korn**, Oakland, CA (US)

(73) Assignee: **Amazon Technologies, Inc.**, Seattle, WA (US)

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(51) **Int. Cl.**

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G10L 15/26	(2006.01)
G10L 13/08	(2013.01)
G06F 3/0488	(2013.01)

(52) **U.S. Cl.**
CPC ***G10L 13/08*** (2013.01); ***G06F 3/0488*** (2013.01)

(58) **Field of Classification Search**
CPC G10L 15/22; G10L 15/26; G10L 13/08; G10L 13/02; G10L 15/1815; G10L 15/32; G10L 13/00; G10L 13/04; G10L 13/10; G10L 15/197; G10L 2015/223; G10L 21/06; G10L 15/063; G10L 15/1807; G10L 15/1822; G10L 13/033; G10L 13/043; G10L 13/047; G10L 13/027; G10L 13/086; G10L 15/00; G10L 15/08; G10L 15/193; G10L 15/30; G10L 17/00; G10L 17/22; G10L 2015/025; G10L 2015/088; G10L 2015/226; G10L 2021/0135; G10L 21/003; G10L 21/0364; G10L 21/12; G10L 25/30; G10L 25/04; G10L 25/60; G10L 25/63; G10L 25/90
USPC 704/260, 235, E15.001, 2, 202, 207, 209, 704/219, 231, 244, 257, 270.1, 275, 9; 386/249, 250, 282
See application file for complete search history.

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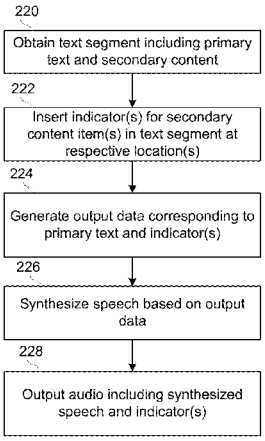
Primary Examiner — Huyen Vo
Assistant Examiner — Rodrigo Chavez
(74) *Attorney, Agent, or Firm* — Pierce Atwood LLP

(57) **ABSTRACT**

A system and method for navigating secondary content. The system may monitor for gestures input to the system by an input device and may detect an arc gesture. The arc gesture may travel along both a horizontal axis and a vertical axis from a first point to a second point and may be delineated from a horizontal or a vertical motion. The system may identify secondary content corresponding to the arc gesture in response to the arc gesture and output data corresponding to the secondary content. The system may identify supplemental text associated with the secondary content and synthesize supplemental speech corresponding to the supplemental text. The output data may include audio including the synthesized supplemental speech.

22 Claims, 16 Drawing Sheets



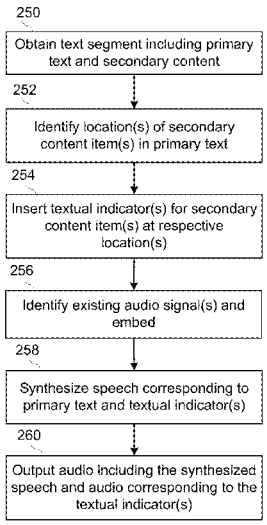


FIG. 1A

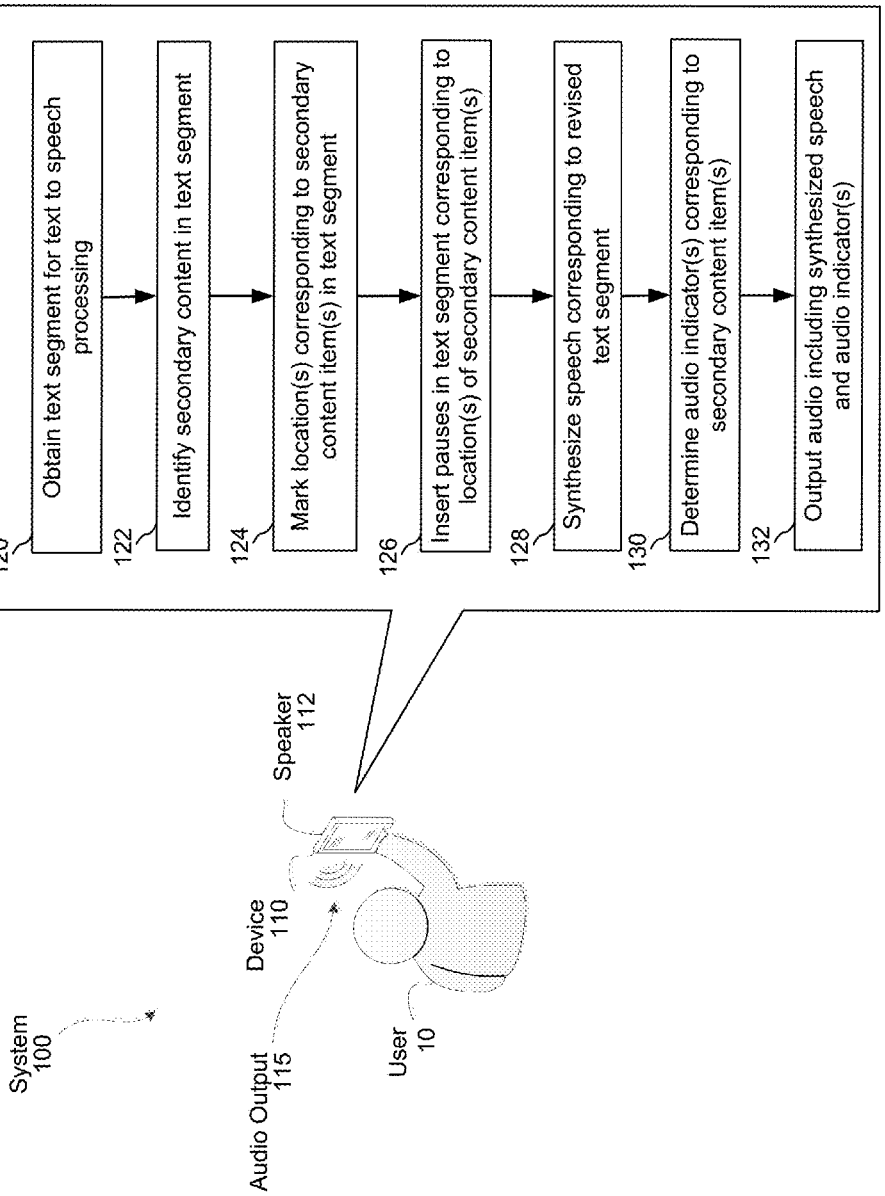

120
Obtain text segment for text to speech processing
122
Identify secondary content in text segment
124
Mark location(s) corresponding to secondary content item(s) in text segment
126
Insert pauses in text segment corresponding to location(s) of secondary content item(s)
128
Synthesize speech corresponding to revised text segment
130
Determine audio indicator(s) corresponding to secondary content item(s)
132
Output audio including synthesized speech and audio indicator(s)
System 100
Device 110
Speaker 112
Audio Output 115
User 10

FIG. 1B

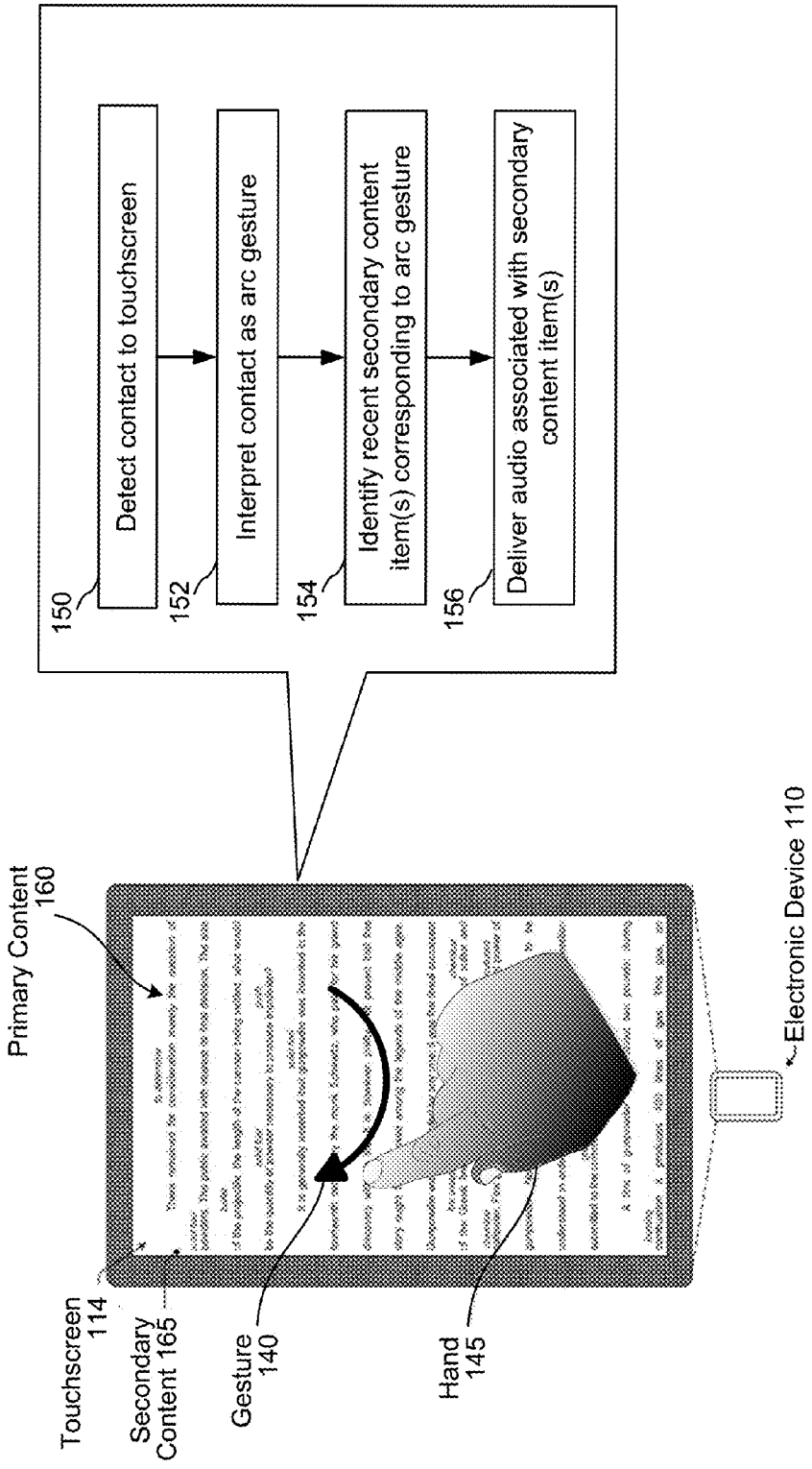

150
Detect contact to touchscreen
152
Interpret contact as arc gesture
154
Identify recent secondary content item(s) corresponding to arc gesture
156
Deliver audio associated with secondary content item(s)
Primary Content 160
Touchscreen 114
Secondary Content 165
Gesture 140
Hand 145
Electronic Device 110

FIG. 1C

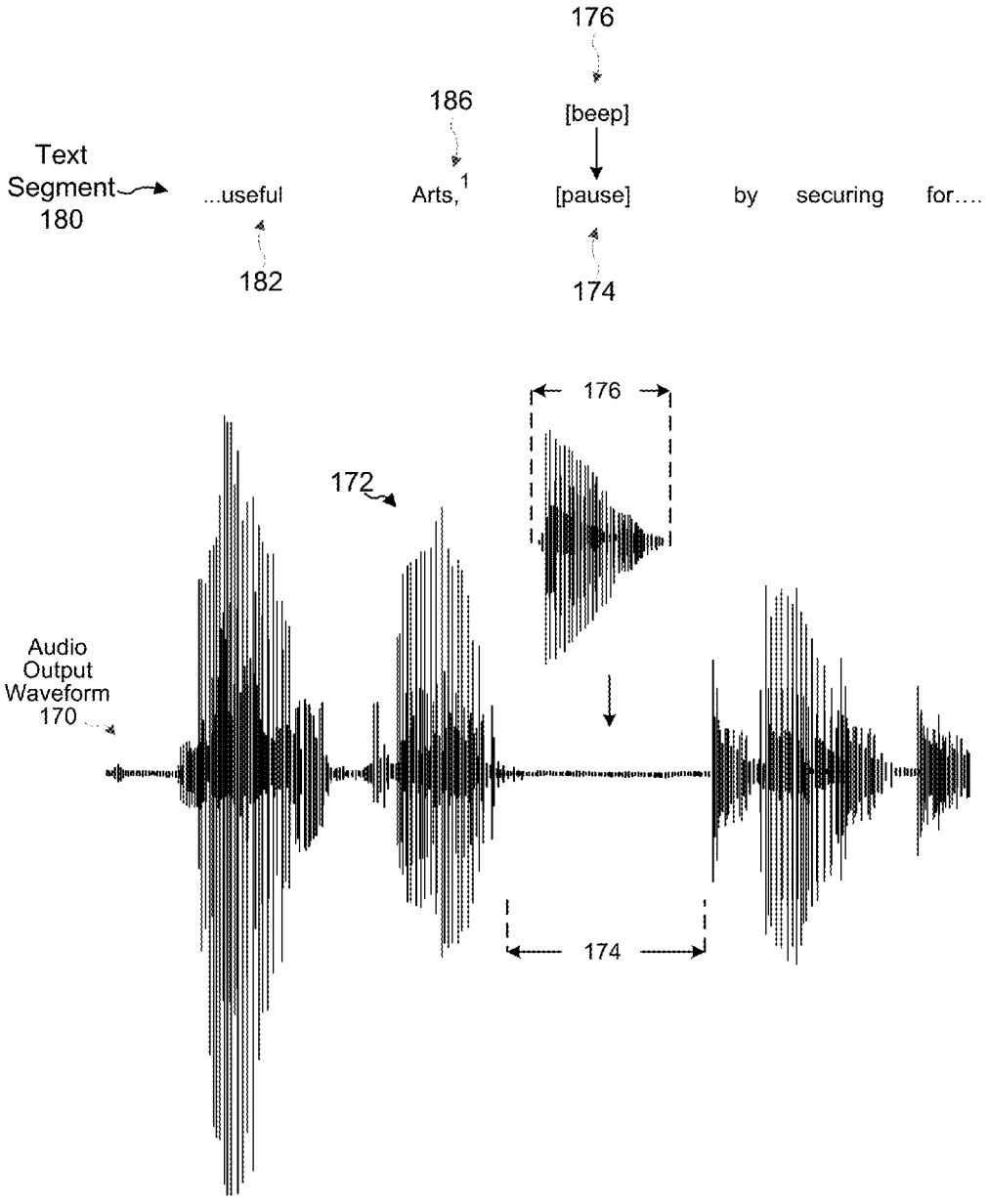

176
186
[beep]
Text Segment 180
...useful
Arts,
[pause]
by
securing
for....
182
174
176
172
Audio Output Waveform 170
174

FIG.2A

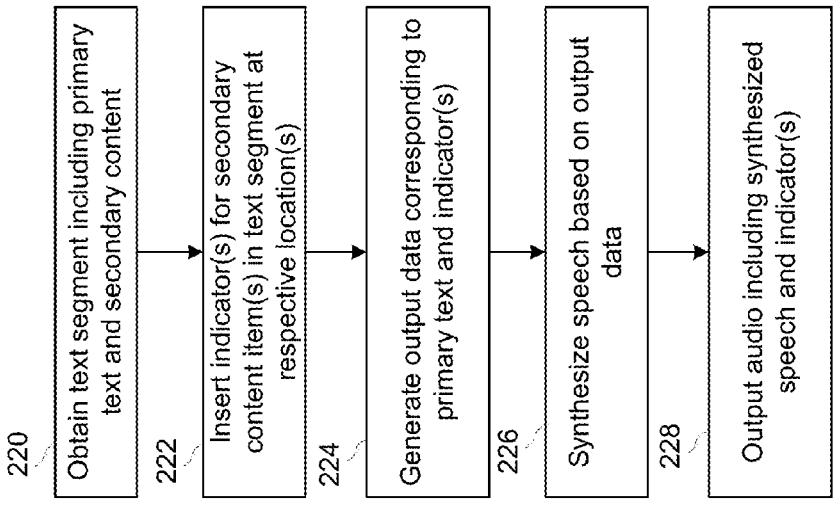

220
Obtain text segment including primary text and secondary content
222
Insert indicator(s) for secondary content item(s) in text segment at respective location(s)
224
Generate output data corresponding to primary text and indicator(s)
226
Synthesize speech based on output data
228
Output audio including synthesized speech and indicator(s)

FIG.2B

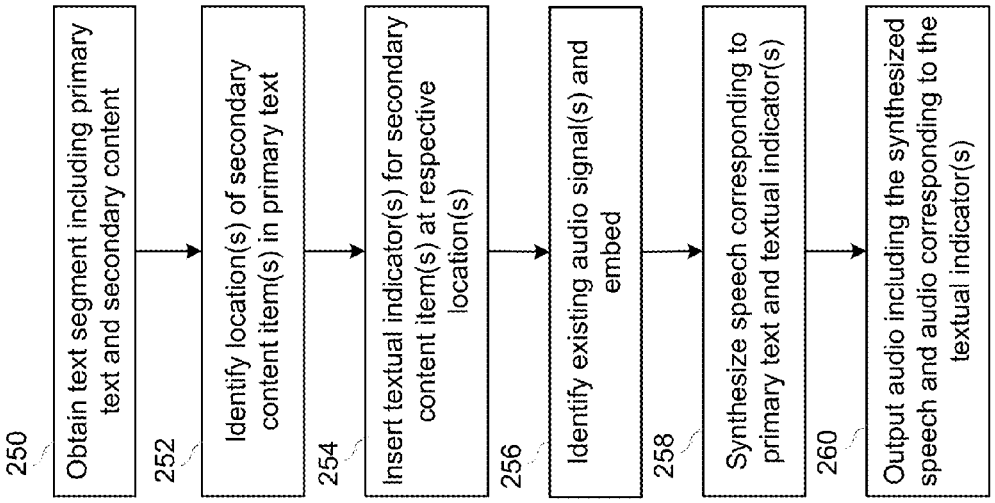

250
Obtain text segment including primary text and secondary content
252
Identify location(s) of secondary content item(s) in primary text
254
Insert textual indicator(s) for secondary content item(s) at respective location(s)
256
Identify existing audio signal(s) and embed
258
Synthesize speech corresponding to primary text and textual indicator(s)
260
Output audio including the synthesized speech and audio corresponding to the textual indicator(s)

FIG. 3A

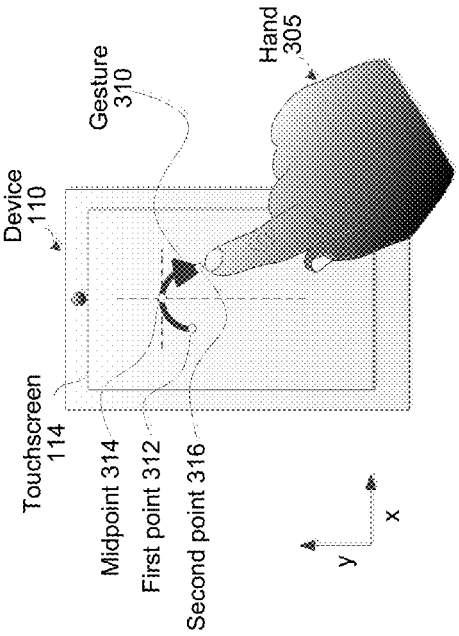


FIG. 3B

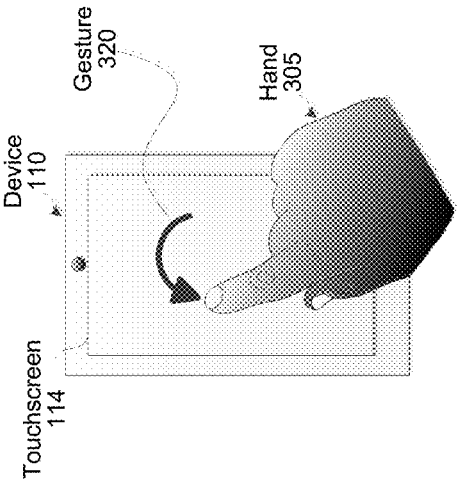


FIG. 3C

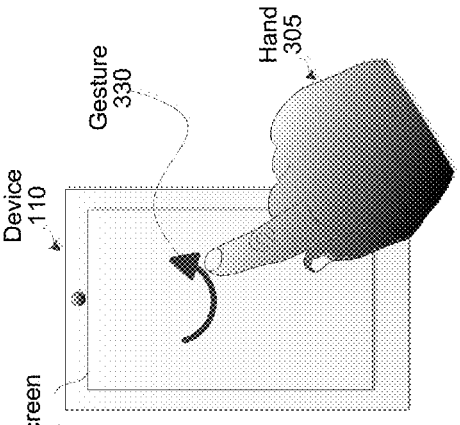


FIG. 3D

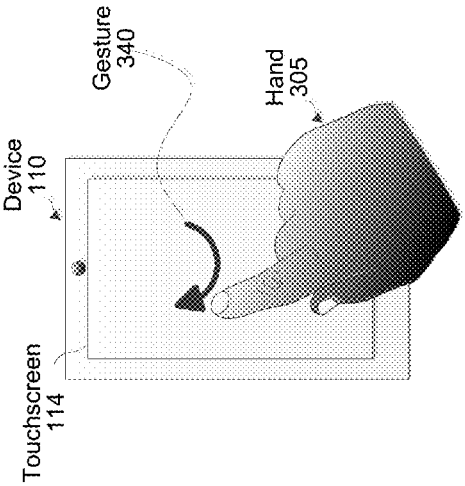


FIG. 4A

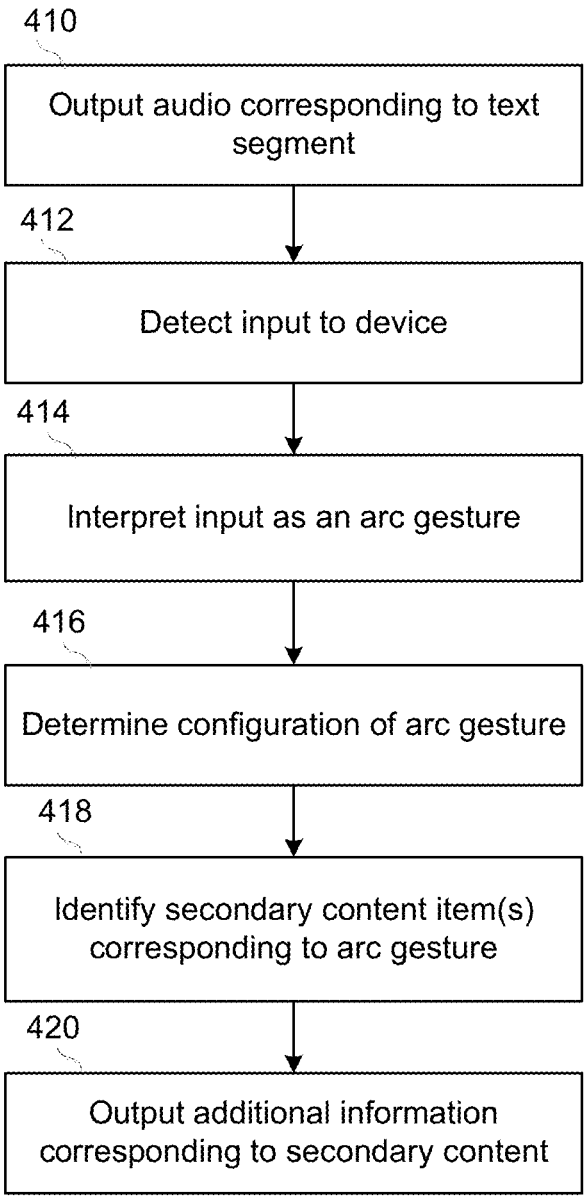

410
Output audio corresponding to text segment
412
Detect input to device
414
Interpret input as an arc gesture
416
Determine configuration of arc gesture
418
Identify secondary content item(s) corresponding to arc gesture
420
Output additional information corresponding to secondary content

FIG. 4B

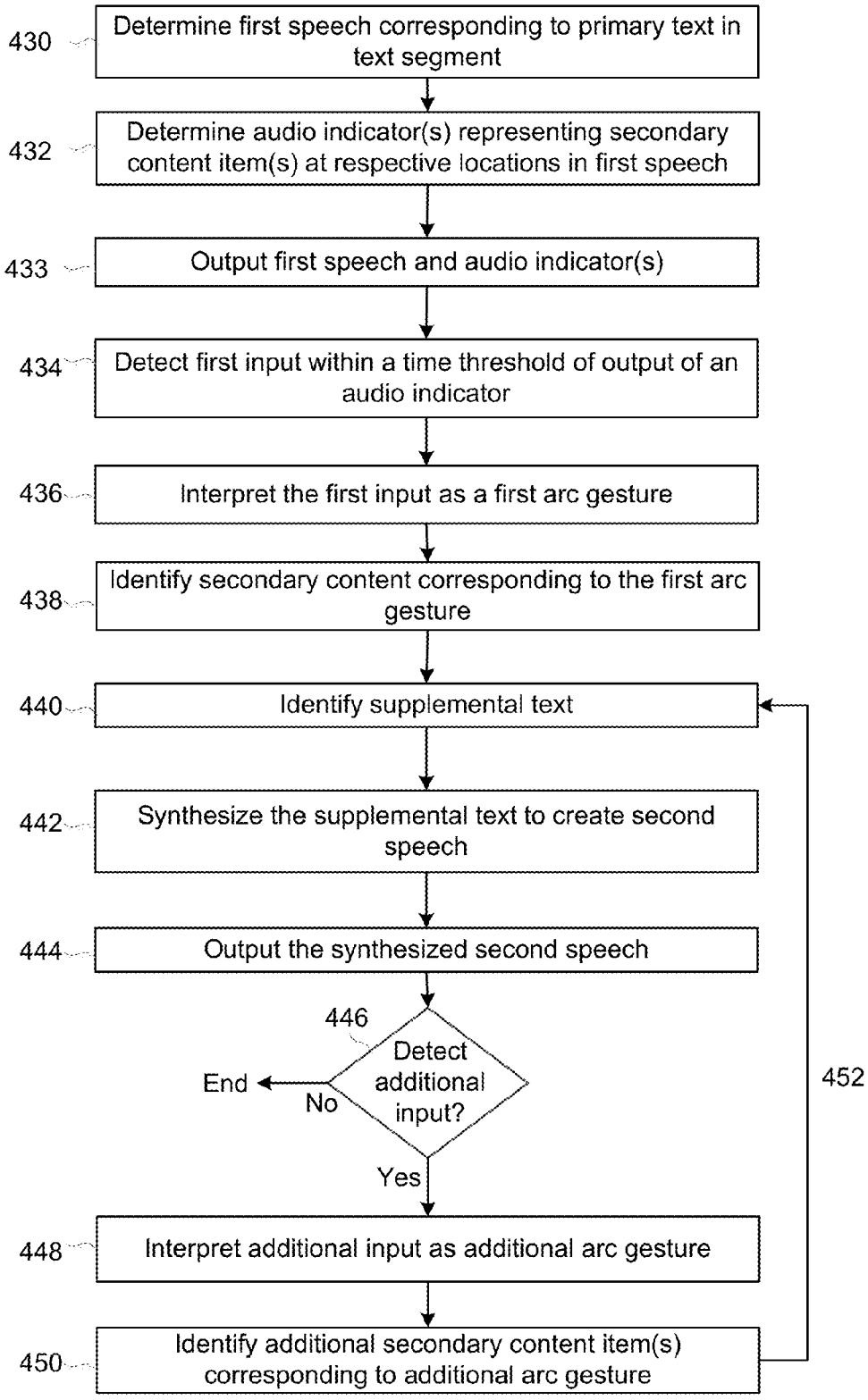

430
Determine first speech corresponding to primary text in text segment
432
Determine audio indicator(s) representing secondary content item(s) at respective locations in first speech
433
Output first speech and audio indicator(s)
434
Detect first input within a time threshold of output of an audio indicator
436
Interpret the first input as a first arc gesture
438
Identify secondary content corresponding to the first arc gesture
440
Identify supplemental text
442
Synthesize the supplemental text to create second speech
444
Output the synthesized second speech
446
Detect additional input?
End
No
Yes
448
Interpret additional input as additional arc gesture
450
Identify additional secondary content item(s) corresponding to additional arc gesture
452

FIG. 4C

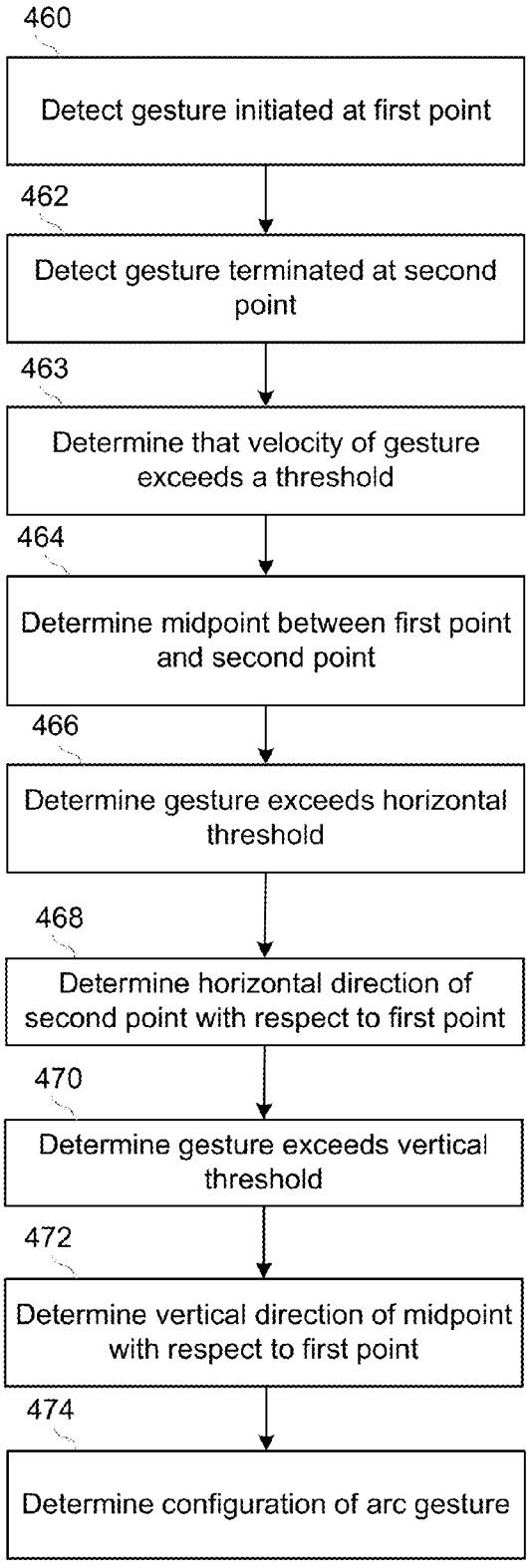

460
Detect gesture initiated at first point
462
Detect gesture terminated at second point
463
Determine that velocity of gesture exceeds a threshold
464
Determine midpoint between first point and second point
466
Determine gesture exceeds horizontal threshold
468
Determine horizontal direction of second point with respect to first point
470
Determine gesture exceeds vertical threshold
472
Determine vertical direction of midpoint with respect to first point
474
Determine configuration of arc gesture

FIG. 5A

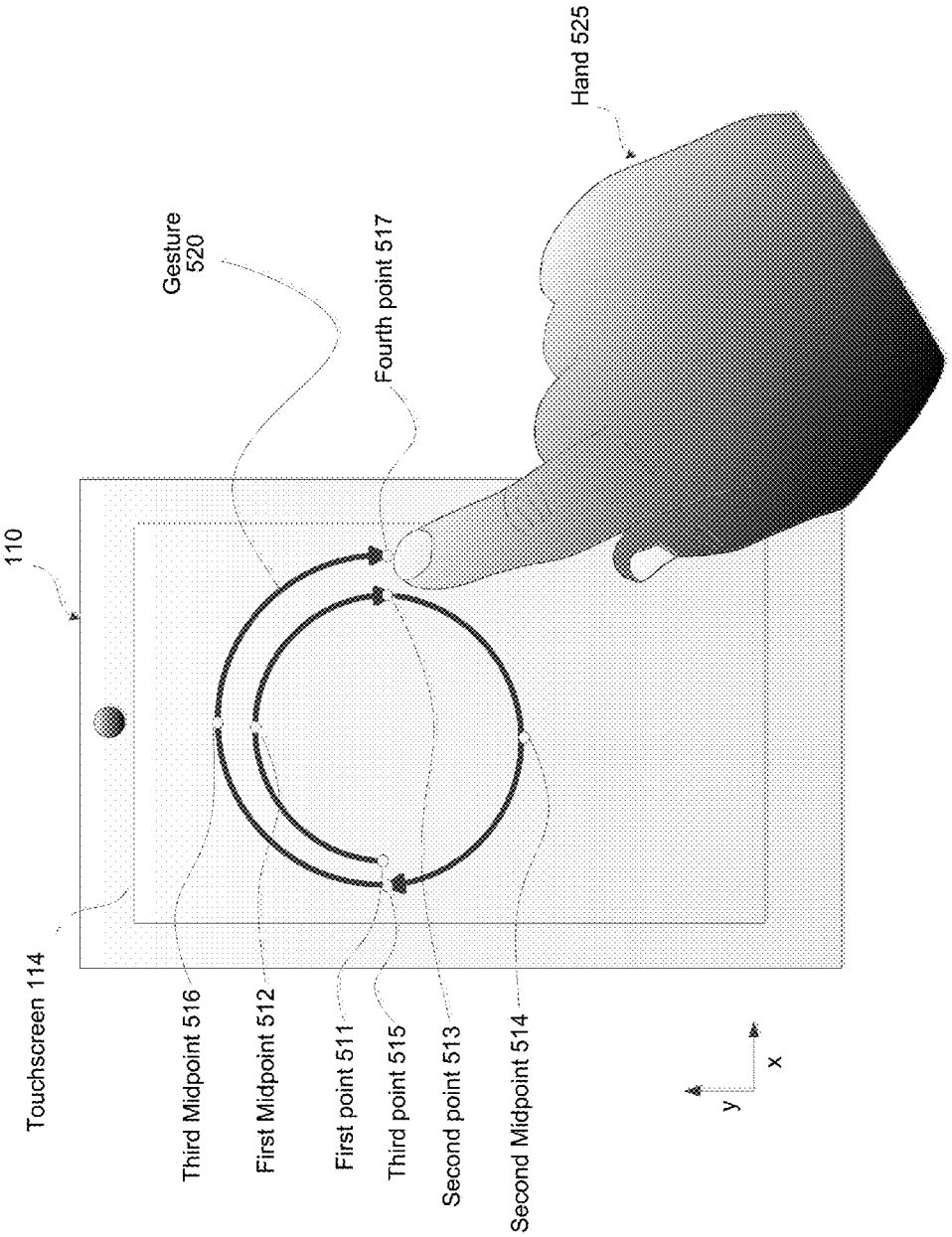

Hand 525
Gesture 520
Fourth point 517
Device 110
Touchscreen 114
Third Midpoint 516
First Midpoint 512
First point 511
Third point 515
Second point 513
Second Midpoint 514
x
y

FIG. 5B

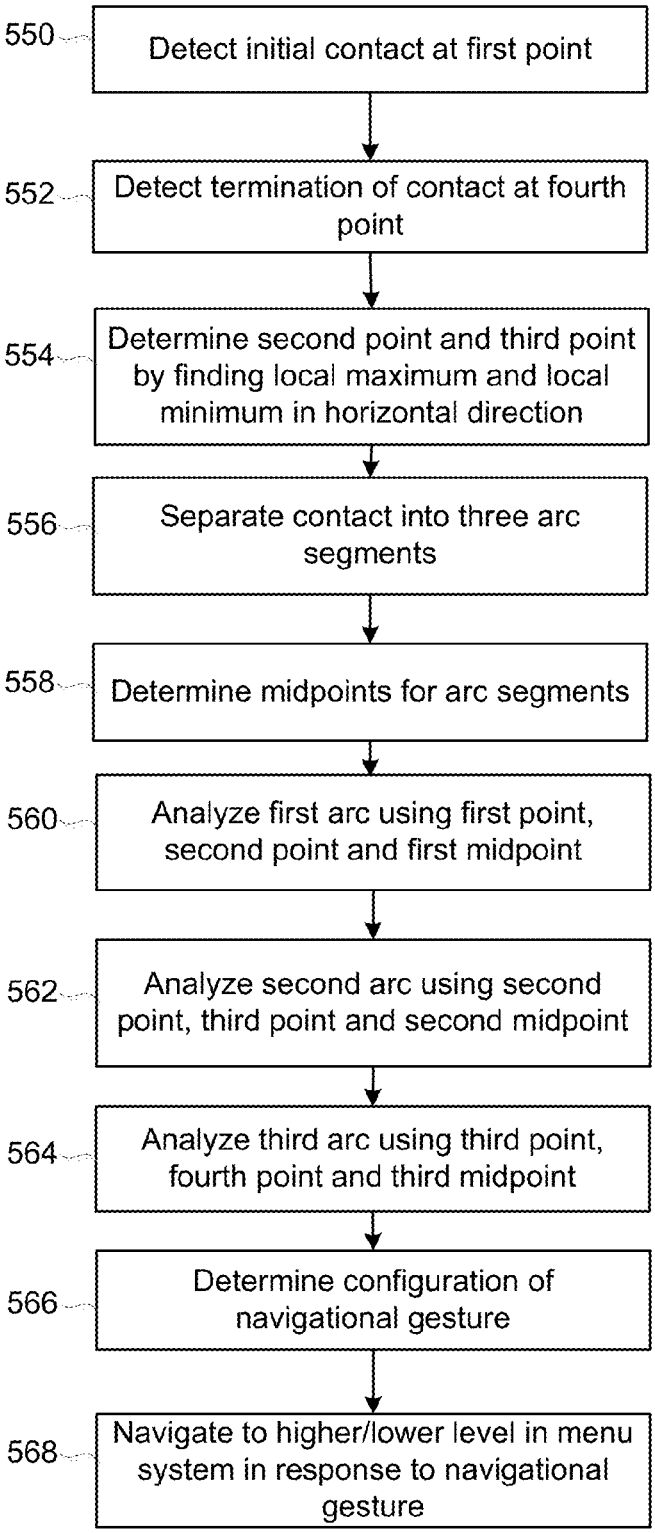

550
Detect initial contact at first point
552
Detect termination of contact at fourth point
554
Determine second point and third point by finding local maximum and local minimum in horizontal direction
556
Separate contact into three arc segments
558
Determine midpoints for arc segments
560
Analyze first arc using first point, second point and first midpoint
562
Analyze second arc using second point, third point and second midpoint
564
Analyze third arc using third point, fourth point and third midpoint
566
Determine configuration of navigational gesture
568
Navigate to higher/lower level in menu system in response to navigational gesture

FIG. 6

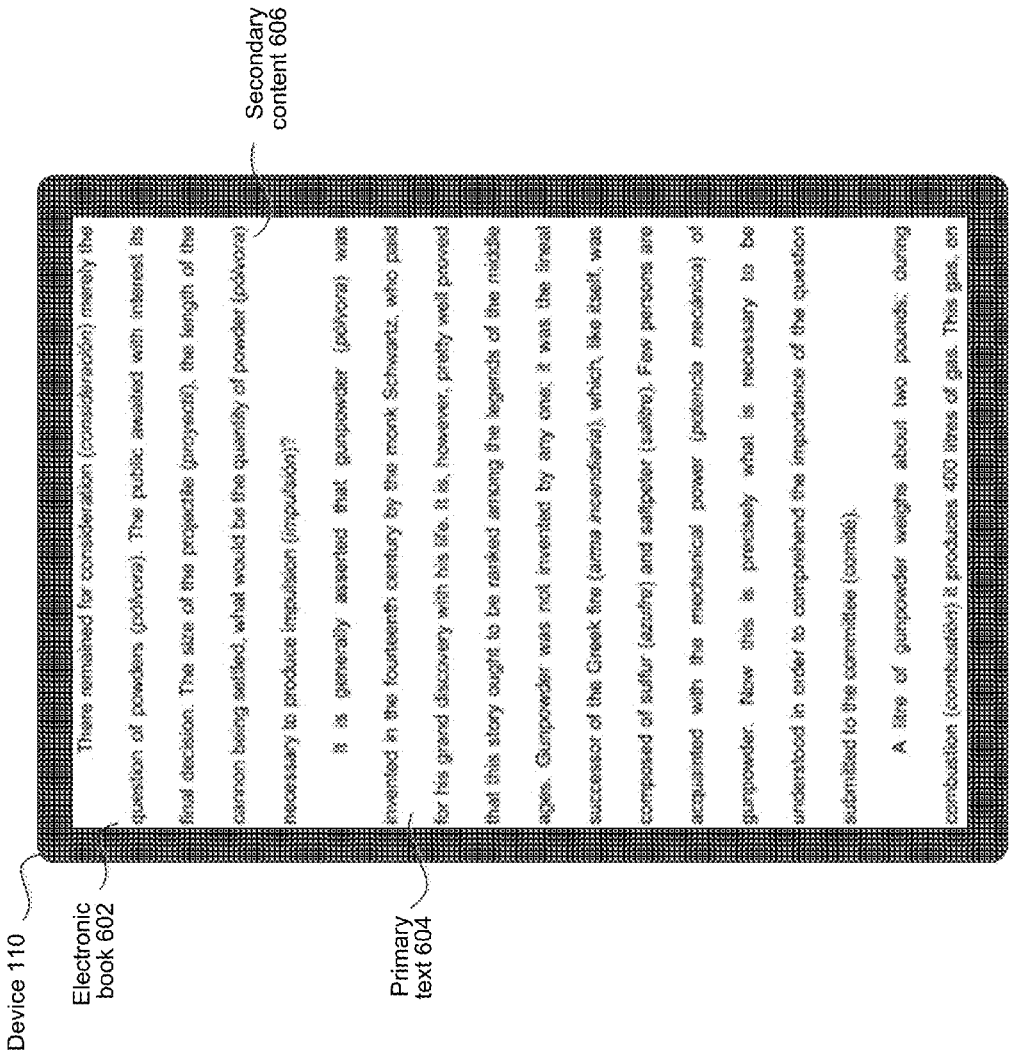

Secondary content 606
There remained for consideration (consideration) merely the question of powders (gutturai). The public awaited with interest its final decision. The size of the projectile (propyrit), the length of the cannon being settled, what would be the quantity of powder (pulvere) necessary to produce propulsion (impulsion)?
It is generally asserted that gunpowder (pulvere) was invented in the fourteenth century by the monk Schwartz, who paid for his grand discovery with his life. It is, however, pretty well proved that this story ought to be ranked among the legends of the middle ages. Gunpowder was not invented by any one. It was the lineal successor of the Greek fire (ignis incendiarii), which, like itself, was composed of sulfur (sulfur) and saltpeter (sulfite). Few persons are acquainted with the mechanical power (potenza meccanica) of gunpowder. Now this is precisely what is necessary to be understood in order to comprehend the importance of the question submitted to the committee (comité).
A litre of gunpowder weighs about two pounds, during combustion (combustion) it produces 400 litres of gas. The gas, on
Device 110
Electronic book 602
Primary text 604

FIG. 7

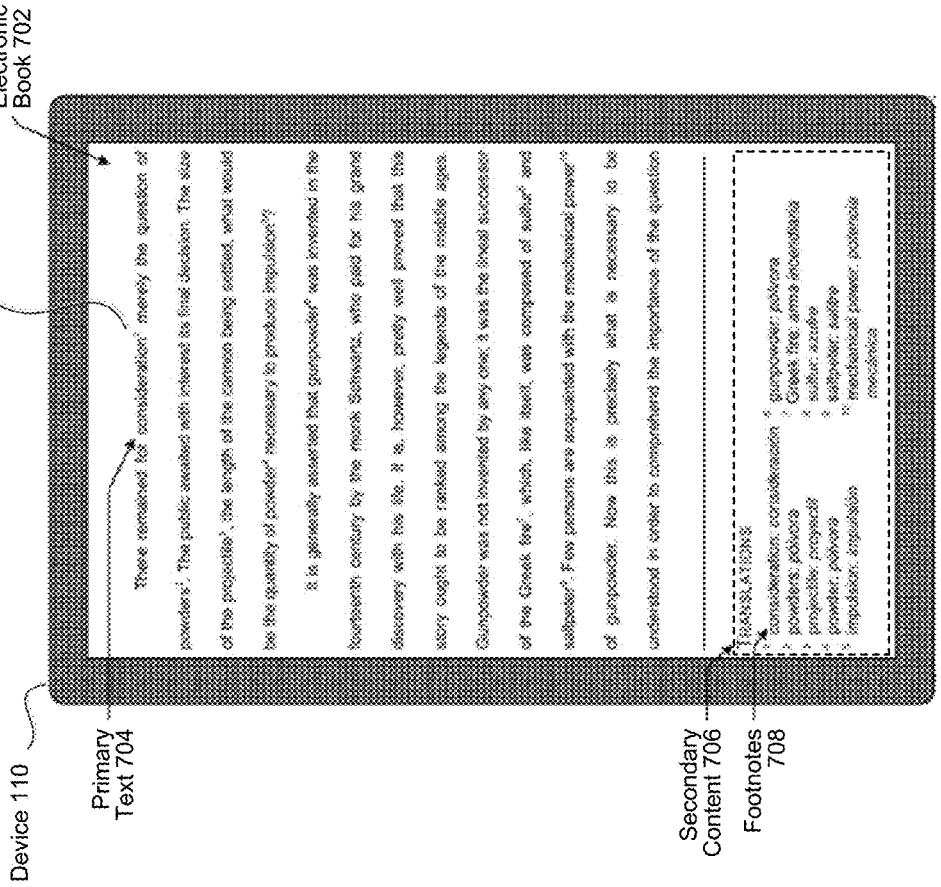

Electronic Book 702
710
Device 110
Primary Text 704
Secondary Content 706
Footnotes 708

FIG. 8

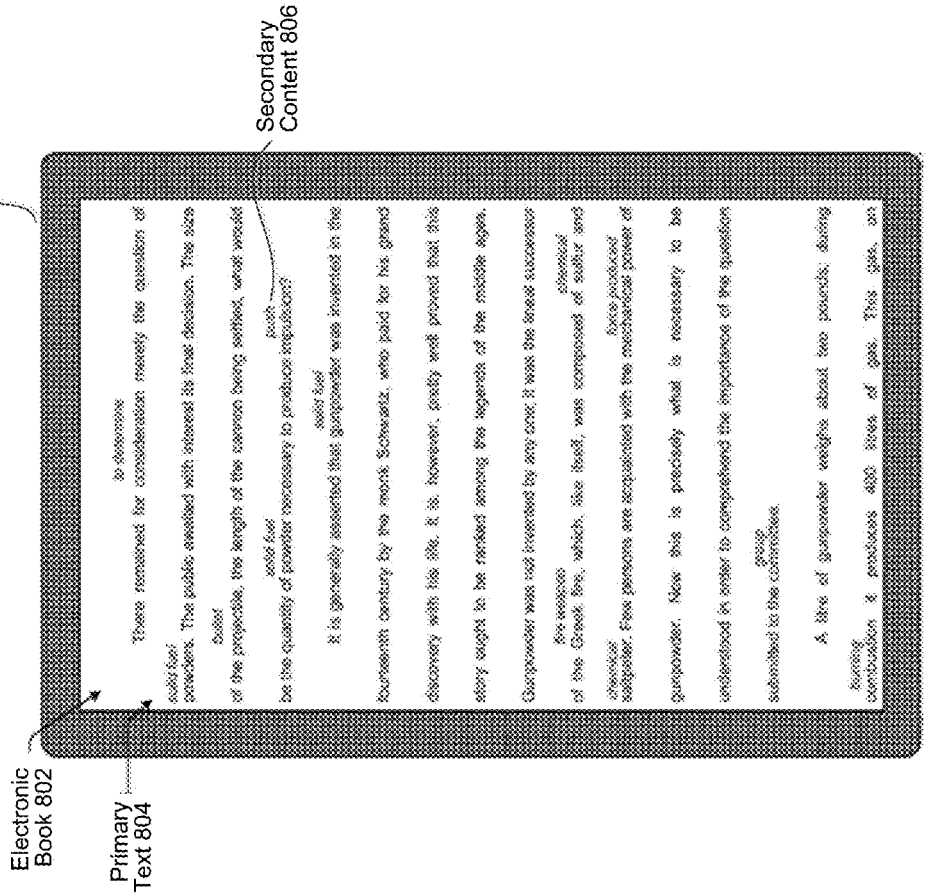

Device 110
Secondary Content 806
Electronic Book 802
Primary Text 804

FIG. 9A

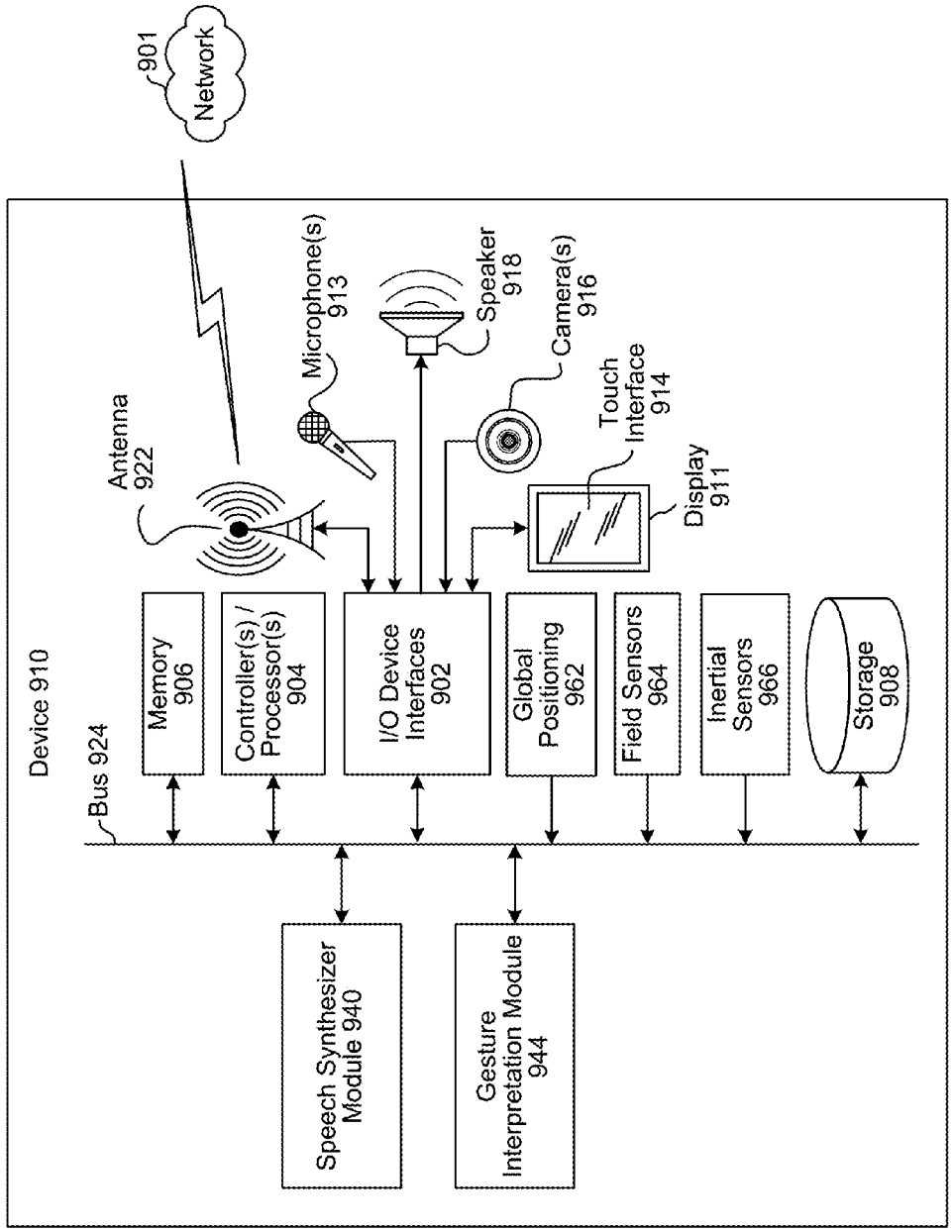

901
Network
Antenna
922
Microphone(s)
913
Speaker
918
Camera(s)
916
Touch
Interface
914
Display
911
Device 910
Bus 924
Memory
906
Controller(s) /
Processor(s)
904
I/O Device
Interfaces
902
Global
Positioning
962
Field Sensors
964
Inertial
Sensors
966
Storage
908
Speech Synthesizer
Module 940
Gesture
Interpretation Module
944

FIG. 9B

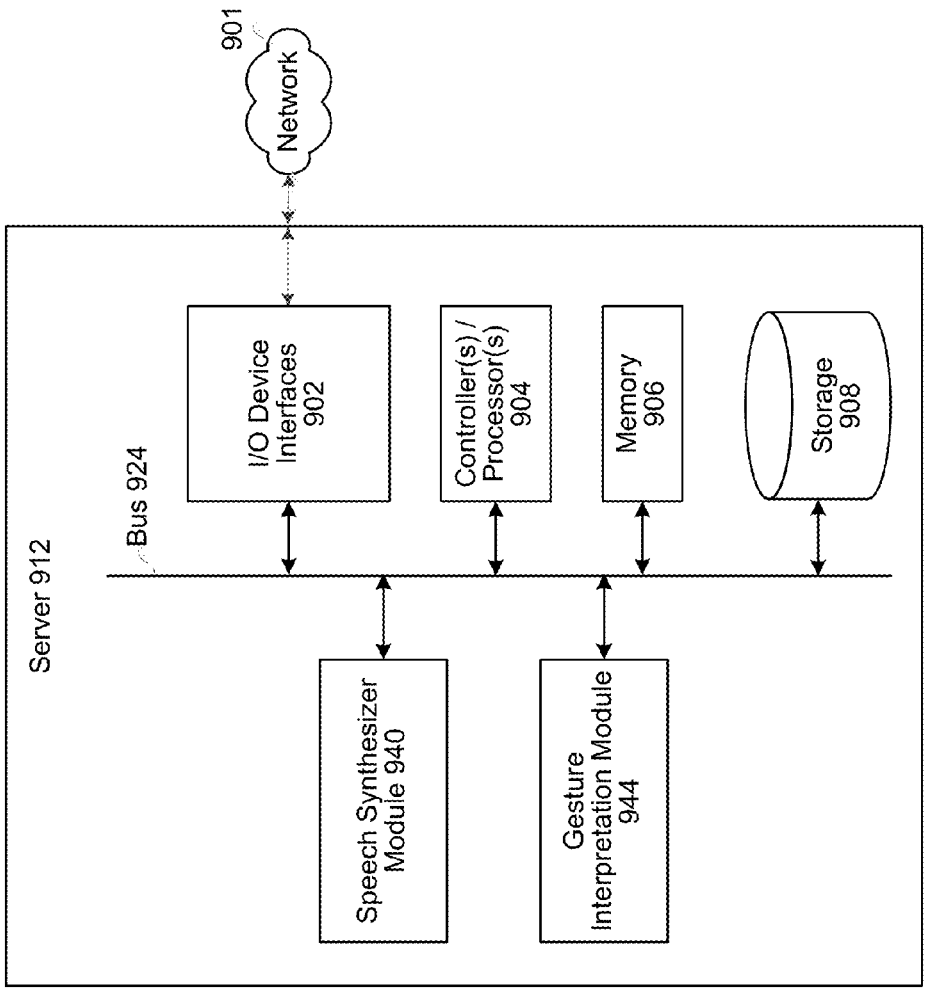
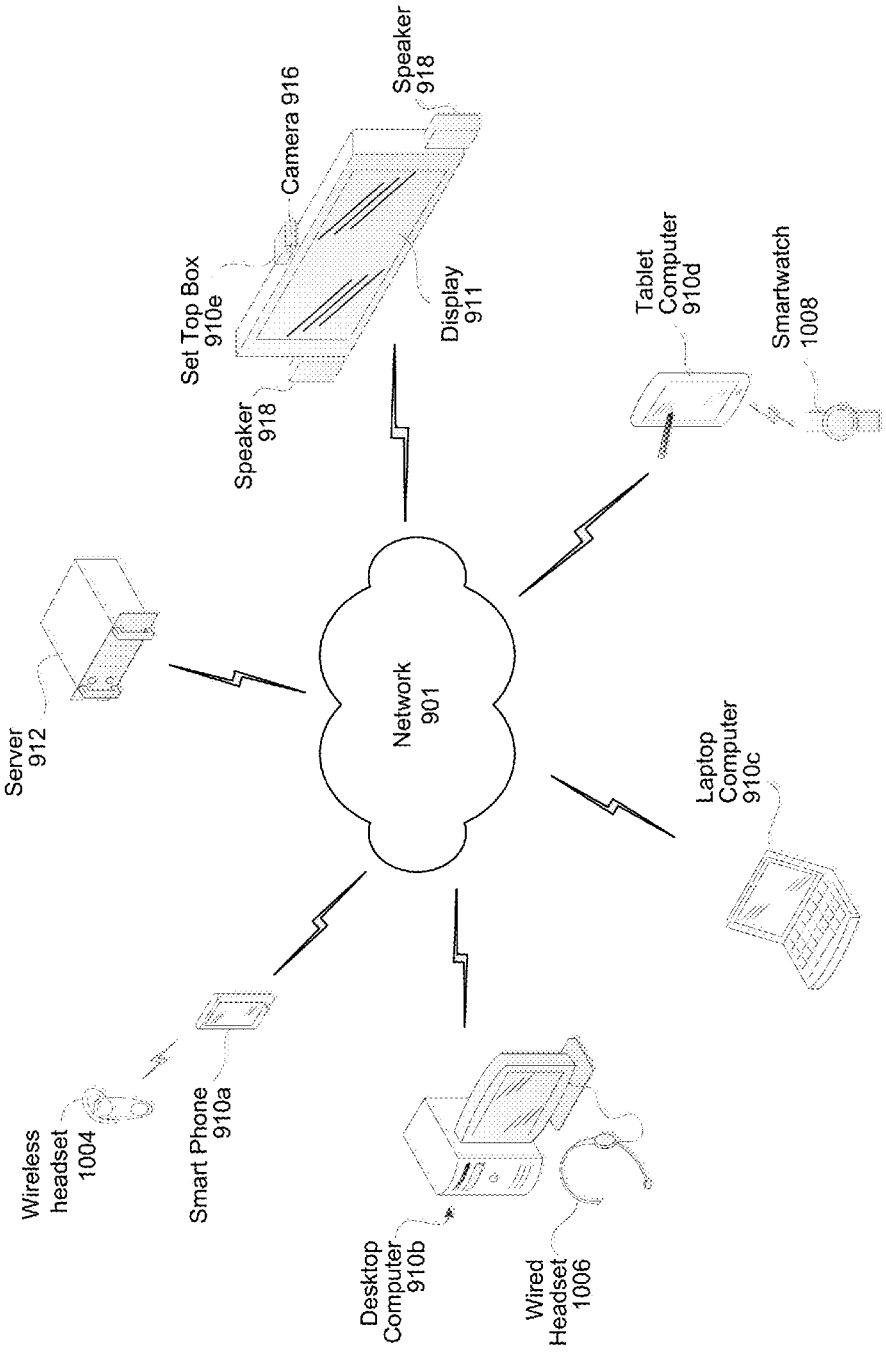

901
Network
Server 912
Bus 924
I/O Device Interfaces 902
Controller(s) / Processor(s) 904
Memory 906
Storage 908
Speech Synthesizer Module 940
Gesture Interpretation Module 944

FIG. 10


Speaker 918
Camera 916
Set Top Box 910e
Display 911
Speaker 918
Tablet Computer 910d
Smartwatch 1008
Server 912
Network 901
Laptop Computer 910c
Wireless headset 1004
Smart Phone 910a
Desktop Computer 910b
Wired Headset 1006

AUDIBLY INDICATING SECONDARY CONTENT WITH SPOKEN TEXT

BACKGROUND

Electronic devices such as computers, smart phones and electronic readers may display books and other text based documents.

BRIEF DESCRIPTION OF DRAWINGS

For a more complete understanding of the present disclosure, reference is now made to the following description taken in conjunction with the accompanying drawings.

FIG. **1**A illustrates a system for audibly indicating secondary content within spoken text using an electronic device.

FIG. **1**B illustrates a gesture for navigating secondary content for users operating an electronic device.

FIG. **1**C illustrates an example of an audio data waveform and text associated with the audio data waveform.

FIG. **2**A illustrates an example of a method for audibly indicating the presence of secondary content.

FIG. **2**B illustrates an example of a method for audibly indicating secondary content.

FIGS. **3**A-**3**D illustrates a gesture being used in four different configurations.

FIG. **4**A illustrates a flowchart of a method for navigating secondary content using gestures.

FIG. **4**B illustrates a flowchart of a method for navigating secondary content using gestures.

FIG. **4**C illustrates a flowchart of a method for interpreting gestures as an arc gesture.

FIG. **5**A illustrates an example of a gesture that may be used to navigate between different levels of secondary content or different menu items.

FIG. **5**B illustrates a flowchart of a method for navigating between different levels of secondary content or different menu items.

FIGS. **6-8** illustrate a device displaying an electronic book with different secondary content.

FIGS. **9**A-**9**B illustrate block diagrams conceptually illustrating components of a system including one or more of an electronic device and a remote server.

FIG. **10** illustrates a network diagram including multiple devices connected over a network.

DETAILED DESCRIPTION

Traditional paper media such as books and other text based documents may display the content of the document which may include both primary text and secondary content. For example, the primary text may include the main passage(s) of the document whereas the secondary content may include footnotes, endnotes, annotations, or the like that relate to, but may be separate from the primary text. A text string (i.e., series of characters) of the document may include both primary text and indicators of secondary content (such as the footnote symbols). When displayed on an electronic device, such as an e-reader, the secondary content of a document may be displayed in a manner similar to the paper media. Further, electronic devices may display additional supplemental content, which may not necessarily be part of the original document, but may be added to enhance the reader's experience when consuming electronic media. Such supplemental content may include later added definitions, synonyms, translations, user notes, and/or other added

items that may be added to a document and displayed electronically. This supplemental content may also refer back to the primary text. The supplemental content may also be considered a type of secondary content. Thus, a document may be associated with secondary content that is included in the original document as well as secondary content that is added later (i.e., supplemental content). So while some of the secondary content may be included in the document as published, such as a footnotes and endnotes included in the original publication, other secondary content may be added to a document and displayed by an electronic device, such as later added suggested definitions, synonyms, annotations, etc. Further, the primary text of the document may include original formatting, such as font variations (bold, italics, underlines, etc.), while additional formatting may be added to the primary text later (such as highlighting, user comments or external comments from other users). For purposes of this disclosure, the main text of the document may be referred to as the primary text, while all other formatting, footnotes, endnotes, supplemental content or other information may be referred to as secondary content.

As a visual interface is capable of concurrently displaying multiple pieces of information, all of this secondary content may be easily displayed on a device and visible to a user without distracting from the primary text. However, an audio interface must sequentially transmit information. Thus, when converting the content of a document to audio, each piece of information is transmitted in order to a listener. If secondary content is transmitted in the middle of primary text, it may distract the listener from the primary text of the document. For example, in the case of a footnote that appears in the middle of a paragraph, if the contents of the footnote are read at the location of the footnote, the listener may be distracted from a flow of the primary text. For example, inserting the word "footnote" as spoken text in the middle of primary text may be distracting. Therefore, there is a need for an audio interface capable of effectively managing secondary content so that the listener is aware of, and may interact with, the secondary content without distracting the listener from the primary text.

In order to effectively identify the existence of secondary content to a listener using an audio interface in a non-distracting fashion, a system may insert a series of non-speech audio signals corresponding to the secondary content within speech corresponding to the primary text. The audio signals may then be output as part of the audio interface to alert the listener to the presence of the secondary content. For example, at the presence of secondary content in a sentence, the device may add a brief delay in the transmission of the sentence and play a unique audio signal corresponding to the type of secondary content, for example a special beep or audible tone. The beep or tone may be of a relatively short duration (such as a second or less) so as to notify the listener of the existence of secondary content without distracting the user from the audio of the primary text. The device may then allow the user to access the secondary content, if desired. For example, if the listener wants to access the secondary content, the device may recognize a particular input, such as an input gesture, and as a result of the gesture pause output of audio corresponding to the primary text and instead output audio corresponding to the contents of the secondary content, for example reading the contents of the footnote.

In order to efficiently access and control the secondary content, the system may utilize a series of new gestures. For example, a first arc gesture may bring up the most recent secondary content. The first arc gesture may also be used to

skip behind to previous secondary content. A second arc gesture opposite the first arc gesture may be used to skip ahead to subsequent secondary content. The listener may navigate back to the primary text using an exit gesture. In addition, while listening to the primary text, a third arc gesture may skip ahead to the next heading, whereas a fourth arc gesture, opposite the third arc gesture, may skip backwards to a previous heading. Other configurations of gestures for navigating secondary content may also be used. Various implementations of the above are described in detail below.

FIG. **1**A illustrates a new system **100** for audibly indicating secondary content within spoken text using an electronic device **110**. Audio indicators may identify the existence of the secondary content to a listener using an audio interface in a non-distracting fashion. Examples of secondary content may include originally existing item such as footnotes, endnotes, formatting such as font variations (bold, italics, underlines, etc.), highlighting or the like, and later added supplemental content such as annotations, definitions, synonyms, translations and/or other added features. In one example, as illustrated in FIG. **1**A, the secondary content is the content of a footnote. Throughout this disclosure, while illustrated examples and the corresponding description may use specific language (such as "supplemental content" or "footnote"), the specific language is intended merely as a palpable example and the disclosure is not limited thereto. Thus, broader terms (in this case, "secondary content") may be substituted without departing from the disclosure.

As illustrated in FIG. **1**A, the device **110** may output audio data **115** to user **10** during a text to speech process. The device **110** may include a speaker **112** configured to transmit the audio data **115**, although a separate speaker, such as headphones or an external speaker connected either wired or wirelessly, may be used in addition to or in place of the speaker **112**. To generate the audio data **115**, the device **110** may perform text to speech processing, for example by converting text of an electronic book or document into an audio signal. As part of converting the electronic book to an audio signal, the device **110** may insert audio indicator(s) within the audio signal, where the audio indicator(s) correspond to the various item(s) of secondary content included in the electronic book.

To insert the audio indicator(s) in the audio data **115**, the device **110** may obtain (**120**) a text segment for text to speech processing. The text segment may be any length, ranging from a single word to a full sentence or a paragraph, but for this example the text segment may be a sentence. The device **110** may identify (**122**) secondary content in or attached to the text segment, including identifying different types of secondary content. For example, the device **110** may identify that a text segment is associated with two footnotes and a definition for a particular word. The device **110** may mark (**124**) location(s) corresponding to secondary content item(s) in the text segment. For example, at the footnote(s) and/or the definition, the device **110** may mark the location corresponding to, and the type of, secondary content. For secondary content associated with or attached to the text segment but not located within the text segment, the device **110** may assign a location within the text segment to use as the location corresponding to the secondary content. The device **110** may insert (**126**) pauses in the text segment using Speech Synthesis Markup Language (SSML) corresponding to the location(s) of the secondary content item(s). However, some speech synthesizers may not require location(s) to be marked and/or explicit pauses inserted in the text segment, so the device **110** may omit steps **124** and/or **126** without departing from the disclosure. If step **124** is omitted, the device **110** may identify location(s) corresponding to the secondary content item(s) in the text segment during the speech synthesis described below. Similarly, if step **126** is omitted, the device **110** may insert pauses as part of the speech synthesis described below, although the device **110** may omit step **126** and not insert pauses without departing from the disclosure.

After marking the location(s) corresponding to the secondary content item(s) within the text segment, the device **110** may separately synthesize (**128**) speech corresponding to the text segment and determine (**130**) audio indicator(s) corresponding to the secondary content item(s). The device **110** may use a speech synthesizer to synthesize the speech using any methods known to one of skill in the art and further described below.

Alternatively, the device **110** may instead combine these steps and determine (**130**) the audio indicator(s) corresponding to the secondary content item(s) while synthesizing (**128**) the speech corresponding to the text segment. For example, the audio indicator(s) may be embedded in the text segment such that synthesizing the speech corresponding to the text segment includes synthesizing the audio indicator(s). As an example of the device **110** synthesizing the speech and/or the audio indicator(s), the device **110** may generate speech data and/or audio tones that are configured to be output as audio data by a speaker component, audio jack, communication equipment or any other audio output device known to one of skill in the art.

Finally, the device **110** may output (**132**) the audio data **115** including the synthesized speech and the audio indicator(s), where the audio indicator(s) is (are) included at location(s) corresponding to the location(s) of the secondary content item(s) within the text segment. The device **110** may track a current location in the text segment with a current moment in the synthesized speech so that the device **110** may switch between the text segment and the synthesized speech using the synchronized current location and the current moment.

Examples of an audio indicator may include a beep, an audio tone or an audio signal. In addition to marking a single location corresponding to individual item(s) of secondary content, the device **110** may mark more than one location for individual item(s) of secondary content. For example, while some secondary content item(s) have discrete location(s) like footnotes, other secondary content item(s) may, for example, format a portion of text, such as highlighting, underlining, bold font, italic font and other formatting. Thus, an audio indicator may include multiple beeps, audio tones or audio signals and may be separated by a portion of text and may be configured to be distinct so that the listener can tell the difference between one kind of audio indicator (i.e., for footnotes) and another (i.e., for highlighting). Alternatively, the beep, audio tone and/or audio signals may continue during playback of the synthesized speech corresponding to the portion of text.

Different kinds of audio indicators may be used. As an example, an audio indicator may change a voice parameter of the speech synthesizer, such as modifying a character, tone, speed or pitch of a voice output by the speech synthesizer. In addition, the audio indicator may cause the speech synthesizer to output the synthesized speech simultaneously using two or more different voices. Further, a virtual placement of the audio indicator in three-dimensional space may be different than a virtual placement of the synthesized speech and/or the audio indicator may modify a virtual placement of the voice output by the speech synthe-

sizer. For example, the virtual placement in three-dimensional space may be based on a type of secondary content, a location of the secondary content in the text segment or the document and/or other settings based on user preferences. As an example using the type of secondary content, an audio indicator associated with a footnote may have a virtual placement on the left side of a listener (for example, through a left speaker or left headphone) whereas an audio indicator associated with a comment may have a virtual placement on the right side of a listener (for example, through a right speaker or right headphone). As an example using the location of the secondary content in the text segment, an audio indicator associated with secondary content corresponding to a location within the text segment may have a virtual placement on the left whereas an audio indicator associated with secondary content corresponding to a location at the end of the text segment may have a virtual placement on the right. As an example of modifying a virtual placement of the voice output by the speech synthesizer, an audio indicator associated with highlighted text may modify the virtual placement of portions of synthesized speech associated with the highlighted text relative to the virtual placement of the remaining synthesized speech. The disclosure is not limited thereto and the virtual placement of the voice output and/or the audio indicator may be based on one or more factors selected based on user preferences. In some examples, the audio indicator may be accompanied by haptic feedback (i.e., vibration).

The device **110** may control a verbosity of the secondary content being included in the output of the device **110**. For example, the device **110** may include user preferences that control which secondary content to include and which secondary content to ignore. Alternatively, the device **110** may use an intelligent program to control the verbosity of the secondary content based on a frequency of requesting each type of secondary content. For example, the device **110** may record how often secondary content is requested and may limit the secondary content being included in the output of the device **110** based on a history of requests. The verbosity of the secondary content may be separated based on the type of secondary content or the type of text being synthesized.

Examples of applications for this disclosure include electronic devices for blind and visually impaired users, such as electronic readers, smartphones, computers and video consoles. However, the disclosure is not limited thereto and has applicability to text to speech applications for visually impaired and sighted users alike. For example, the text to speech process may be performed on an electronic device in a car, allowing the user to listen to the text of the book while driving. As another example, the text to speech process may be used with electronic text documents or websites. Other applications may include foreign language training to provide spoken examples of the foreign language text. Another application may be for users with speech impairments, such as users who use a speech generating device to interface with the world. For example, the methods disclosed above may allow a communicatively limited user to format text to add inflection to the synthesized speech. By formatting individual words, the user may carefully control an inflection of the synthesized speech.

To access secondary content, a device may be configured to recognize one or more input gestures that allow a user to navigate and control audio data associated with secondary content. For example, FIG. **1**B illustrates a new gesture **140** for navigating secondary content **165** for users **10** operating an electronic device **110**. As illustrated in FIG. **1**B, the electronic device **110** may include a touchscreen **114** configured to detect contact and display primary content **160** and secondary content **165**. The device **110** may generate audio data **115** that includes synthesized speech corresponding to a text segment of the primary content **160** and audio indicator(s) corresponding to item(s) of the secondary content **165**. To navigate between item(s) of the secondary content **165**, the user **10** may contact the touchscreen **114**, for example with a hand **145**, and the device **110** may interpret the contact as a gesture **140**. The gesture **140** may be used to request additional information associated with the secondary content item(s) indicated by the audio indicator(s). For example, after an audio indicator alerts the user **10** of the existence of a secondary content item, such as a footnote, the user **10** may perform the gesture **140** to request that the device **110** provide the additional information associated with the secondary content item, for example by delivering audio associated with the footnote.

To determine if the gesture **140** is present, the device **110** may detect (**150**) contact to the touchscreen **114**. The device **110** may then interpret (**152**) the contact as an arc gesture by analyzing the contact and determining if the contact begins at a first point and travels to a second point along an arc. For example, the device **110** may detect that the hand **145** initiates contact with the touchscreen **114** at the first point and travels along both a horizontal axis of the device **110** and a vertical axis of the device **110** to the second point, at which point the device **110** no longer detects contact between the hand **145** and the touchscreen **114**. To interpret the contact as the gesture **140**, the device **110** may determine that a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeds a horizontal threshold. Similarly, to interpret the contact as the gesture **140**, the device **110** may determine that a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint between the first point and the second point exceeds a vertical threshold. Interpreting the contact as the gesture **140**, along with determining the midpoint and the horizontal and vertical thresholds is described in greater detail below with regard to FIGS. **3**A-**3**D.

If the device **110** determines that the contact corresponds to the preconfigured gesture **140**, the device **110** may identify (**154**) recent secondary content item(s) that correspond to the audio indicator(s) preceding the gesture **140**. For example, the device **110** may determine the most recent audio indicator and identify a location of the secondary content item(s) that correspond to the most recent audio indicator. The device **110** may deliver (**156**) audio associated with the secondary content item(s) that correspond to the audio indicator(s), for example by performing a text to speech process on the text of the secondary content item(s) and outputting the synthesized speech as audio.

When synthesizing audio associated with the secondary content, voice parameters of the speech synthesizer for the secondary content may be different than the voice parameters of the speech synthesizer for the primary content. For example, the voice parameters may modify a character, tone, speed or pitch of a voice output by the speech synthesizer. Further, the voice parameters of the speech synthesizer for the secondary content may modify a virtual placement of the voice output by the speech synthesizer in three-dimensional space (for example, synthesizing or outputting audio to simulate a speaker to the listener's left or right).

FIG. **1**C illustrates an example of an audio data waveform **170** and a text segment **180** associated with the audio data

waveform **170**. The text segment **180** may include primary text **182** and an indicator associated with secondary content **186** (e.g., footnote **1**) (e.g. " . . . useful Arts[1], by securing for . . . "). The indicator itself may also be considered secondary content. As illustrated in FIG. **1**C, the device **110** may generate primary audio signal(s) **172** based on the primary text **182** and may insert pause(s) **174** in the primary audio signal(s) **172** based on a location within the primary text **182** corresponding to the secondary content **186**. As discussed above, for secondary content **186** associated with or attached to the text segment **180** but not located within the primary text **182**, the device **110** may also assign a location within the primary text **182** as the location corresponding to the secondary content **186**.

The device **110** may insert secondary content audio signal(s) **176** in the pause(s) **174** inserted in the primary audio signal(s) **172**. The pause(s) **174** may be a fixed length used for other instances of secondary content of the same type as secondary content **186** (e.g., footnotes), may be of variable length based on a type of secondary content **186** or may be based on a length of the secondary content audio signal(s) **176** associated with the individual instances of secondary content **186**. Thus, the secondary content audio signal(s) **176** may provide an audio notification of the presence of the secondary content **186** within the text segment **180**. For example, the secondary content audio signal(s) **176** may alert a user to the presence of the secondary content **186** without interrupting the primary audio signal(s) **172** to output text associated with the secondary content **186**.

FIG. **2**A illustrates an example of a method for audibly indicating the presence of secondary content by a system **100**. The primary information may include images and/or text along with secondary content associated with the images and/or text. The system **100** may convert the images and/or text to text segments and may associate the secondary content with the corresponding text segments. As illustrated in FIG. **2**A, the system **100** may obtain (**220**) a text segment that includes primary text and secondary content associated with the text segment. If secondary content is associated with or attached to the text segment but not located within the primary text, the system **100** may assign a location within the primary text as corresponding to the secondary content. The system **100** may insert (**222**) indicator(s) for secondary content item(s) in the text segment based on respective location(s) of the secondary content item(s) in the text segment, wherein the indicator(s) is (are) configured to be processed during text to speech processing to enable an audible sound in audio data. For example, the system **100** may insert the indicator(s) at the respective location(s) of the secondary content item(s) in the text segment, or the system **100** may insert the indicator(s) at approximate location(s) based on punctuation or other factors. In some examples, the secondary content may already include indicator(s) associated with the secondary content. If the secondary content already includes indicator(s), the system **100** may modify the existing indicator(s) to enable the system **100** to audibly indicate the presence of secondary content during output of the audio data. Alternatively, the system **100** may be enabled to audibly indicate the presence of the secondary content based on the existing indicator(s) without modification of the indicator(s), so step **222** may be omitted. For example, documents created using a first platform or application may include the indicator(s) and the system **100** may therefore omit step **222**, whereas documents created using a second platform or application may not include the indicator(s) and the system **100** may include step **222** to insert the indicator(s).

The indicator(s) may indicate audio information to be synthesized by the system **100** or the indicator(s) may reference an audio signal to be output by the system **100**. The system **100** may generate (**224**) output data corresponding to the primary text and the indicator(s). The system **100** may synthesize (**226**) speech based on the output data. As an example of the system **100** synthesizing the speech and/or the indicator(s), the system **100** may generate speech data and/or audio tones that are configured to be output as audio data by a speaker component, audio jack, communication equipment or any other audio output device known to one of skill in the art.

The device **110** may track a current location in the primary text with a current moment in the synthesized speech so that the device **110** may switch between the primary text and the synthesized speech using the synchronized current location and the current moment. The system **100** may insert pause(s) in the synthesized speech corresponding to respective location(s) of the secondary content item(s) in the text segment. For example, the system **100** may explicitly insert pause(s) in the text segment while inserting (**222**) the indicator(s), or the system **100** may insert pause(s) in the synthesized speech during the synthesizing (**226**) based on the indicator(s). The system **100** may output (**228**) audio including the synthesized speech and the indicator(s). For example, the system **100** may output the audio using a text to speech engine for both the synthesized speech and the indicator(s) or the system **100** may output the audio by mixing the indicator(s) with the synthesized speech using an audio mixer.

The system **100** may include a local device configured to perform text to speech processing and/or synthesis and to output audio data including the synthesized speech. Alternatively, the system **100** may include a remote device configured to perform text to speech processing and/or synthesis and to transmit the generated output data to a local device for audio playback. Thus, the steps illustrated in FIG. **2**A may be split and/or shared between a local device and a remote device. For example, the remote device may perform some or all of the speech synthesizing and the local device may perform the remaining speech synthesizing and/or output audio signals. In one example, the remote device may perform steps **220**, **222** and **224** and transmit the generated output data to the local device, while the local device may synthesize (**226**) speech based on the output data and may output (**228**) audio including the synthesized speech and the indicators(s).

The system **100** may use a speech synthesizer to synthesize the speech using any methods known to one of skill in the art. Examples of indicator(s) may include a beep, an audio tone or an audio signal. In addition, indicator(s) may change a voice parameter of the speech synthesizer, such as modifying a character, tone, speed or pitch of a voice output by the speech synthesizer. Further, a virtual placement of the indicator(s) in three-dimensional space may be different than a virtual placement of the synthesized speech and/or the indicator(s) may modify a virtual placement of the voice output by the speech synthesizer. For example, the virtual placement in three-dimensional space may be based on a type of secondary content item(s), a location of the secondary content item(s) in the text segment or the document and/or other settings based on user preferences. As an example using the type of secondary content item(s), indicator(s) associated with a footnote may have a virtual placement on the left whereas indicator(s) associated with a comment may have a virtual placement on the right. As an example using the location of the secondary content item(s) in the text segment, indicator(s) associated with secondary

content item(s) located within the text segment may have a virtual placement on the left whereas indicator(s) associated with secondary content item(s) located at the end of the text segment may have a virtual placement on the right. As an example of modifying a virtual placement of the voice output by the speech synthesizer, indicator(s) associated with highlighted text may modify the virtual placement of portions of synthesized speech associated with the highlighted text relative to the virtual placement of the remaining synthesized speech. The disclosure is not limited thereto and the virtual placement of the voice output and/or the indicator(s) may be based on one or more factors selected based on user preferences.

FIG. **2**B illustrates an example of a method for audibly indicating secondary content by a system **100**. The primary information may include images and/or text along with secondary content associated with the images and/or text. The system **100** may convert the images and/or text to text segments and may associate the secondary content with the corresponding text segments. As illustrated in FIG. **2**B, the system **100** may obtain (**250**) a text segment including primary text and secondary content associated with the text segment. If secondary content is associated with or attached to the text segment but not located within the primary text, the system **100** may assign a location within the primary text for the secondary content. The system **100** may identify (**252**) location(s) of secondary content item(s) in the primary text. The system **100** may insert (**254**) textual indicator(s) for secondary content item(s) at respective location(s), the textual indicator(s) formatted according to a markup language used to annotate texts for speech synthesis. Examples of markup languages may include speech synthesis markup language (SSML), embedded audio commands or other text to speech languages. As part of or in addition to the textual indicator(s), the system **100** may insert explicit delays for the speech synthesis. In some examples, the secondary content item(s) may already include textual indicator(s) associated with the secondary content item(s). If the secondary content item(s) already include textual indicator(s), the system **100** may modify the existing textual indicator(s) to enable the system **100** to audibly indicate the presence of the secondary content item(s) during output of the audio data. Alternatively, the system **100** may be enabled to audibly indicate the presence of the secondary content item(s) based on the existing textual indicator(s) without modification of the textual indicator(s), so step **254** may be omitted. For example, documents created using a first platform or application may include the textual indicator(s) and the system **100** may therefore omit step **254**, whereas documents created using a second platform or application may not include the textual indicator(s) and the system **100** may include step **254** to insert the textual indicator(s).

To provide a detailed example, primary information may include images, text and/or other media. In some examples using an electronic device, the primary information may include multiple data files. For example, the primary information may include a media file and one or more side files associated with the media file, such as a document, ebook, etc. The one or more side files may be used for metadata associated with the media file, navigational information associated with the media file, primary text, supplemental content and/or other secondary content. For example, the one or more side files may be used to include information that was not known at the time of original publication or that may be updated regularly. This may allow the electronic device to update the media file by modifying and/or replacing the one or more side files without modifying and/or replacing the media file.

The secondary content may be included in the media file and/or the one or more side files. As discussed above with regard to step **254**, the secondary content item(s) may already include textual indicator(s) associated with the secondary content item(s). For example, the textual indicator(s) may associate the secondary content item(s) with metadata, navigational information or other information stored in the one or more side files. Thus, the textual indicator(s) may include the location(s) of secondary content item(s). The system **100** may identify the location(s) in step **252** using the textual indicator(s) and may therefore be enabled to audibly indicate the presence of the secondary content item(s) based on the existing textual indicator(s) without performing step **254** to insert or modify the textual indicator(s).

The system **100** may determine that existing audio signal(s) correspond to the textual indicator(s). Examples of existing audio signals may include .wav files or other audio data already stored on the system **100**. For example, an existing audio signal may be a special tone configured to indicate a footnote to a listener. If existing audio signal(s) correspond(s) to the textual indicator(s), the system **100** may identify (**256**) the existing audio signal(s) and embed the existing audio signal(s) or location(s) of the existing audio signal(s) in the textual indicator(s). The system **100** may synthesize (**258**) speech corresponding to the primary text and any textual indicator(s) that lack existing audio signal(s). As an example of the system **100** synthesizing the speech and/or the textual indicator(s), the system **100** may generate speech data and/or audio tones that are configured to be output as audio data by a speaker component, audio jack, communication equipment or any other audio output device known to one of skill in the art.

The device **110** may track a current location in the primary text with a current moment in the synthesized speech so that the device **110** may switch between the primary text and the synthesized speech using the synchronized current location and current moment. As part of this speech synthesis, the system **100** may insert delays in the speech at the location(s) of textual indicator(s). Based on the speech synthesizer, the delays may be explicitly inserted in the markup language as discussed above with regard to step **254** and/or the delays may be implicitly inserted at the location(s) of the textual indicator(s) by the speech synthesizer. The delays may be identical for textual indicator(s) or may vary based on the length of the existing audio signal or a type of secondary content. For example, a first existing audio signal may have a length of one second, so a corresponding delay may last at least 1 second. A second existing audio signal may have a length of two seconds, so a corresponding delay may last at least two seconds.

Finally, the system **100** may output (**260**) audio including the synthesized speech and audio corresponding to the textual indicator(s) at their respective locations in the speech based on the corresponding textual indicator's location in the primary text. For example, the system **100** may output audio including the synthesized speech, and at location(s) of secondary content item(s) or indicators within the primary text the synthesized speech may include delay(s) and the system **100** may either output the existing audio signal corresponding to the secondary content item(s) or output an audio signal corresponding to the secondary content item(s) that is generated by the speech synthesizer.

As discussed above, the system **100** may include a local device **110** configured to perform text to speech processing

and/or synthesis and to output audio data including the synthesized speech. Alternatively, the system **100** may include a remote device configured to perform text to speech processing and/or synthesis and to transmit the generated output data to a local device for audio playback. Thus, the steps illustrated in FIG. **2**B may be split and/or shared between a remote device and a local device. For example, the remote device may perform some or all of the speech synthesizing and the local device may perform the remaining speech synthesizing and/or output audio signals.

In a first example, the remote device may perform steps **250**, **252** and **254** and transmit the primary text and textual indicator(s) to the local device. The local device may perform step **256** and output (**260**) the synthesized speech as audio, including all existing audio signals and synthesized textual indicator(s) at respective locations in the speech based on the corresponding textual indicator's location in the primary text.

In a second example, the remote device may perform steps **250**, **252**, **254**, **256** and **258** and then transmit the synthesized speech and textual indicator(s) to the local device. The local device may output (**260**) the synthesized speech as audio, including all existing audio signals and synthesized textual indicator(s) at respective locations in the speech based on the corresponding textual indicator's location in the primary text.

In a third example, the remote device may perform steps **250**, **252**, **254** and **258** and then transmit the synthesized speech and textual indicator(s) to the local device. The local device may perform step **256** and output (**260**) the synthesized speech as audio, including all existing audio signals and synthesized textual indicator(s) at respective locations in the speech based on the corresponding textual indicator's location in the primary text. Other examples are also possible.

FIGS. **3**A-**3**D illustrate a new gesture being used in four different configurations. While the method of detecting and interpreting the gesture is similar between FIGS. **3**A-**3**D, the device **110** may differentiate between each of the four different configurations based on a location of each of a first point, a second point and a midpoint between the first point and the second point. Each configuration illustrated in FIGS. **3**A-**3**D may be mapped to a different result. For example, each configuration may be mapped or assigned to a different input or button in an operating system on the device **110**.

To detect the gesture, the device **110** may use any point between the first point and the second point as the midpoint. Alternatively, the device **110** may compare vertical coordinates between the first point and the second point to a first vertical coordinate of the first point and determine a local maximum or local minimum having the greatest absolute vertical distance from the first point to use as the midpoint.

FIG. **3**A illustrates a gesture **310** having a first configuration. As illustrated in FIG. **3**A, the gesture **310** may move left to right in a positive vertical arcing motion. For example, the device **110** may detect that a hand **305** initiates contact with a touchscreen **114** of the device **110** at a first point **312** on the left side of the touchscreen **114**. The device **110** may detect that the hand **305** continues to contact the touchscreen **114** while moving in a positive vertical arcing motion from the first point **312** to a second point **316** on the right side of the touchscreen **114**, at which point the device **110** does not detect further contact between the hand **305** and the touchscreen **114**. While a horizontal coordinate of the second point **316** may be substantially similar to a horizontal coordinate of the first point **312**, the disclosure is not limited thereto and the horizontal coordinate of the second point **316** may be different than the horizontal coordinate of the first point **312** so long as the contact travels more than a horizontal threshold in the horizontal direction and a vertical threshold in the vertical direction.

To interpret the contact as the gesture **310**, the device **110** may first determine an appropriate midpoint between the first point **312** and the second point **316**. By comparing vertical coordinates between the first point **312** and the second point **316** to a first vertical coordinate of the first point **312**, the device **110** may locate a local maximum at the top middle of the touchscreen **114** and use this as the midpoint **314**.

The device **110** may interpret the contact as the gesture **310** if a difference between a first horizontal coordinate associated with the first point **312** and a second horizontal coordinate associated with the second point **316** exceeds a horizontal threshold, and a difference between the first vertical coordinate associated with the first point **312** and a second vertical coordinate associated with the midpoint **314** exceeds a vertical threshold. The thresholds may be an absolute value, a relative value or a desired ratio between the vertical distance and the horizontal distance. As a first example, an absolute value may be a desired distance in either the vertical and the horizontal direction, such as one inch (or a certain number of pixels across the touchscreen **114**). Thus, the device **110** may interpret the contact as the gesture **310** if the horizontal distance between the second point **316** and the first point **312** is greater than one inch and the vertical distance between the midpoint **314** and the first point **312** is greater than one inch. However, the absolute value may be controlled by the device **110** and may vary between the horizontal threshold and the vertical threshold. As a second example, a relative value may be a desired ratio between the vertical distance and the horizontal distance of greater than 1:4. Thus, the device **110** may interpret the contact as the gesture **310** if the vertical distance between the midpoint **314** and the first point **312** is greater than 25% of the horizontal distance between the second point **316** and the first point **312**. The relative value or desired ratio may be controlled by the device **110** and may be based on user preferences. In addition, the vertical threshold may be a relative value while the horizontal threshold may be an absolute value, or vice versa.

After determining that the contact exceeds the horizontal and vertical thresholds, the device **110** may determine the configuration of the gesture **310**. For example, the device **110** may determine that the contact traveled in a left to right motion by comparing the horizontal coordinates of the first point **312** and the second point **316**. For example, the second point **316** is to the right of the first point **312** on an x axis of the touchscreen **114**, so the second horizontal coordinate is greater than the first horizontal coordinate and the difference between the first horizontal coordinate and the second horizontal coordinate is in the positive x direction. Thus, the device **110** may interpret the contact as a left to right motion. Similarly, the device **110** may use the vertical coordinates of the first point **312** and the midpoint **314** to determine if the contact was in a positive vertical direction or a negative vertical direction. For example, the second vertical coordinate is greater than the first vertical coordinate on a y axis of the touchscreen **114**, as the midpoint **314** is above the first point **312**, so the device **110** may determine that the vertical difference between the first vertical coordinate and the second vertical coordinate is in the positive y direction. Thus, the device **110** may interpret the contact as a left to right arc motion in the positive vertical direction, which is the first configuration of the gesture **310**.

FIG. 3B illustrates a gesture **320** having a second configuration. As illustrated in FIG. 3B, the gesture **320** may move right to left in a positive vertical arcing motion. For example, the device **110** may detect that a hand **305** initiates contact with a touchscreen **114** of the device **110** at a first point on the right side of the touchscreen **114**. The device **110** may detect that the hand **305** continues to contact the touchscreen **114** while moving in a positive vertical arcing motion from the first point to a second point on the left side of the touchscreen **114**, at which point the device **110** does not detect further contact between the hand **305** and the touchscreen **114**. While a horizontal coordinate of the second point may be substantially similar to a horizontal coordinate of the first point, the disclosure is not limited thereto and the horizontal coordinate of the second point may be different than the horizontal coordinate of the first point so long as the contact travels more than a horizontal threshold in the horizontal direction and a vertical threshold in the vertical direction.

To interpret the contact as the gesture **320**, the device **110** may first determine an appropriate midpoint between the first point and the second point. By comparing vertical coordinates between the first point and the second point to a first vertical coordinate of the first point, the device **110** may locate a local maximum at the top middle of the touchscreen **114** and use this as the midpoint.

The device **110** may interpret the contact as the gesture **320** if a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeds a horizontal threshold, and a difference between the first vertical coordinate associated with the first point and a second vertical coordinate associated with the midpoint exceeds a vertical threshold. As discussed in greater detail with regard to FIG. **3**A, the thresholds may be an absolute value or a relative value or desired ratio between the vertical distance and the horizontal distance.

After determining that the contact exceeds the horizontal and vertical thresholds, the device **110** may determine the configuration of the gesture **320**. For example, the device **110** may determine that the contact traveled in a right to left motion by comparing the horizontal coordinates of the first point and the second point. As the second point is to the left of the first point on the x axis of the touchscreen **114**, the second horizontal coordinate is less than the first horizontal coordinate and the difference between the first horizontal coordinate and the second horizontal coordinate is in the negative x direction. Thus, the device **110** may interpret the contact as a right to left motion. Similarly, the device **110** may use the vertical coordinates of the first point and the midpoint to determine if the contact was in a positive vertical direction or a negative vertical direction. For example, the second vertical coordinate is greater than the first vertical coordinate on the y axis of the touchscreen **114**, as the midpoint is above the first point, so the device **110** may determine that the vertical difference between the first vertical coordinate and the second vertical coordinate is in the positive y direction. Thus, the device **110** may interpret the contact as a right to left arc motion in the positive vertical direction, which is the second configuration of the gesture **320**.

FIG. 3C illustrates a gesture **330** having a third configuration. As illustrated in FIG. 3C, the gesture **330** may move left to right in a negative vertical arcing motion. For example, the device **110** may detect that a hand **305** initiates contact with a touchscreen **114** of the device **110** at a first point on the left side of the touchscreen **114**. The device **110** may detect that the hand **305** continues to contact the touchscreen **114** while moving in a negative vertical arcing motion from the first point to a second point on the right side of the touchscreen **114**, at which point the device **110** does not detect further contact between the hand **305** and the touchscreen **114**. While a horizontal coordinate of the second point may be substantially similar to a horizontal coordinate of the first point, the disclosure is not limited thereto and the horizontal coordinate of the second point may be different than the horizontal coordinate of the first point so long as the contact travels more than a horizontal threshold in the horizontal direction and a vertical threshold in the vertical direction.

To interpret the contact as the gesture **330**, the device **110** may first determine an appropriate midpoint between the first point and the second point. By comparing vertical coordinates between the first point and the second point to a first vertical coordinate of the first point, the device **110** may locate a local minimum at the bottom middle of the touchscreen **114** and use this as the midpoint.

The device **110** may interpret the contact as the gesture **330** if a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeds a horizontal threshold, and a difference between the first vertical coordinate associated with the first point and a second vertical coordinate associated with the midpoint exceeds a vertical threshold. As discussed in greater detail with regard to FIG. **3**A, the thresholds may be an absolute value or a relative value or desired ratio between the vertical distance and the horizontal distance.

After determining that the contact exceeds the horizontal and vertical thresholds, the device **110** may determine the configuration of the gesture **330**. For example, the device **110** may determine that the contact traveled in a left to right motion by comparing the horizontal coordinates of the first point and the second point. For example, the second point is to the right of the first point on the x axis of the touchscreen **114**, so the second horizontal coordinate is greater than the first horizontal coordinate and the difference between the first horizontal coordinate and the second horizontal coordinate is in the positive x direction. Thus, the device **110** may interpret the contact as a left to right motion. Similarly, the device **110** may use the vertical coordinates of the first point and the midpoint to determine if the contact was in a positive vertical direction or a negative vertical direction. For example, the second vertical coordinate is less than the first vertical coordinate on the y axis of the touchscreen **114**, as the midpoint is below the first point, so the device **110** may determine that the vertical difference between the first vertical coordinate and the second vertical coordinate is in the negative y direction. Thus, the device **110** may interpret the contact as a left to right arc motion in the negative vertical direction, which is the third configuration of the gesture **330**.

FIG. 3D illustrates a gesture **340** having in a fourth configuration. As illustrated in FIG. 3D, the gesture **340** may move right to left in a negative vertical arcing motion. For example, the device **110** may detect that a hand **305** initiates contact with a touchscreen **114** of the device **110** at a first point on the right side of the touchscreen **114**. The device **110** may detect that the hand **305** continues to contact the touchscreen **114** while moving in a negative vertical arcing motion from the first point to a second point on the left side of the touchscreen **114**, at which point the device **110** does not detect further contact between the hand **305** and the touchscreen **114**. While a horizontal coordinate of the sec-

ond point may be substantially similar to a horizontal coordinate of the first point, the disclosure is not limited thereto and the horizontal coordinate of the second point may be different than the horizontal coordinate of the first point so long as the contact travels more than a horizontal threshold in the horizontal direction and a vertical threshold in the vertical direction.

To interpret the contact as the gesture **340**, the device **110** may first determine an appropriate midpoint between the first point and the second point. By comparing vertical coordinates between the first point and the second point to a first vertical coordinate of the first point, the device **110** may locate a local minimum at the bottom middle of the touchscreen **114** and use this as the midpoint.

The device **110** may interpret the contact as the gesture **340** if a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeds a horizontal threshold, and a difference between the first vertical coordinate associated with the first point and a second vertical coordinate associated with the midpoint exceeds a vertical threshold. As discussed in greater detail with regard to FIG. **3**A, the thresholds may be an absolute value or a relative value or desired ratio between the vertical distance and the horizontal distance.

After determining that the contact exceeds the horizontal and vertical thresholds, the device **110** may determine the configuration of the gesture **340**. For example, the device **110** may determine that the contact traveled in a right to left motion by comparing the horizontal coordinates of the first point and the second point. For example, the second point is to the left of the first point on the x axis of the touchscreen **114**, so the second horizontal coordinate is less than the first horizontal coordinate and the difference between the first horizontal coordinate and the second horizontal coordinate is in the negative x direction. Thus, the device **110** may interpret the contact as a right to left motion. Similarly, the device **110** may use the vertical coordinates of the first point and the midpoint to determine if the contact was in a positive vertical direction or a negative vertical direction. For example, the second vertical coordinate is less than the first vertical coordinate on the y axis of the touchscreen **114**, as the midpoint is below the first point, so the device **110** may determine that the vertical difference between the first vertical coordinate and the second vertical coordinate is in the negative y direction. Thus, the device **110** may interpret the contact as a right to left arc motion in the negative vertical direction, which is the fourth configuration of the gesture **340**.

While the gestures illustrated in FIGS. **3**A-**3**D have a left to right or right to left configuration, the disclosure is not limited thereto. For example, gestures may have a top to bottom or bottom to top configuration with the first point at the top of the screen and the second point at the bottom of the screen or vice versa. The same steps may apply to both left to right and top to bottom configurations by rotating individual steps by 90°. For example, instead of determining a midpoint based on a maximum or minimum vertical coordinate, the device **110** may determine a midpoint based on a maximum or minimum horizontal coordinate. Similarly, the vertical threshold may be determined by a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with the second point, whereas the horizontal threshold may be determined by a difference between the first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the midpoint.

While FIGS. **3**A-**3**D illustrate the contact traveling roughly 120°, the device **110** may interpret contact as an arc gesture if the contact travels anywhere from about 90° to about 270°, without departing from the present disclosure. For example, if the device **110** is oriented so that a top of the device **110** is considered North (0°), the first point for the first configuration may be West (270°) and the second point may be East (90°), for an arc of 180°. Alternatively, the first point may be Northwest (315°) and the second point may be Northeast (45°), for an arc of 90°.

While the gestures illustrated above in FIGS. **3**A-**3**D are based on contact with a touchscreen, other inputs may be used. For example, a camera may detect a subject and the device **110** may interpret movement of the subject as corresponding to one of the arc gestures as discussed above with regard to FIGS. **3**A-**3**D. Examples of a subject may include a hand of a user, a controller or any device capable of being moved in a gesture and detected by the camera. Thus, a user may wave a hand in an arc motion and the device **110** may track the hand and interpret the arc motion as one of the arc gestures discussed above with regard to FIGS. **3**A-**3**D. For example, the user may begin the arc motion in a top middle location and wave the hand in a clockwise direction ending in a bottom middle location. Similarly, a user may wave a controller and the device **110** may track the controller using a discernible feature or mechanism included in the controller. The device **110** may interpret a motion of the controller as one of the arc gestures discussed above with regard to FIGS. **3**A-**3**D. For example, the user may begin motion at a right middle location and wave the controller in a counter-clockwise direction ending in a left middle location.

Examples of applications for the gestures illustrated in FIGS. **3**A-**3**D may include navigating secondary content, menu items, structure or other content. For example, the first configuration and second configuration in the positive vertical direction may be used to navigate between structure of a document or different menu items. The first configuration illustrated in FIG. **3**A may be used to navigate ahead to a subsequent menu item, block of content or header/heading/sub-heading, while the second configuration illustrated in FIG. **3**B may be used to navigate back to a previous menu item, block of content or header/heading/sub-heading. The second configuration may also be used to navigate to the most recent menu item, block of content or header/heading/sub-heading. Similarly, the third configuration and fourth configuration in the negative vertical direction may be used to navigate between secondary content. The third configuration illustrated in FIG. **3**C may be used to navigate ahead to subsequent secondary content, while the fourth configuration illustrated in FIG. **3**D may be used to navigate back to previous secondary content. The fourth configuration may also be used to navigate to the most recent secondary content in response to an audio indicator. As an alternative, the third configuration and fourth configuration may be used to navigate between all types of secondary content, while the first configuration and the second configuration may be used to navigate between selected types of secondary content. The selected types of secondary content may be based on user preferences and may be limited, as one example, to only footnotes and/or comments to facilitate convenient navigation.

FIG. **4**A illustrates an example of a simplified flowchart for navigating secondary content using gestures. As illustrated in FIG. **4**A, the device **110** may output (**410**) audio corresponding to a text segment, the text segment including primary text and secondary content associated with the text

segment. The audio may include first speech corresponding to the primary text in the text segment and audio indicator(s) corresponding to secondary content item(s). The device **110** may track a current location in the primary text synchronized with a current moment in the first speech so that the device **110** may switch between the primary text and the first speech using the synchronized current location and the current moment. The device **110** may detect (**412**) input to the device. Such inputs may be detected, for example, using a touchscreen, a camera, motion sensors or other devices configured to detect gestures. The device **110** may interpret (**414**) the input as an arc gesture, for example if the input travels along both a horizontal axis and a vertical axis from a first point to a second point and exceeds both a vertical threshold and a horizontal threshold. In this example, a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeding a horizontal threshold in a first direction relative to the first point, and a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the first arc gesture exceeding a vertical threshold in a second direction relative to the first point.

Based on detecting (**412**) the input, interpreting (**414**) the input as the arc gesture and/or determining (**416**) the configuration of the arc gesture, the device **110** may interrupt outputting (**410**) of the audio. For example, the device **110** may stop outputting (**410**) the audio once the input is detected (**412**) and may output an audio signal and/or haptic feedback as a notification that the device **110** interpreted (**414**) the input as the arc gesture and determined (**416**) the configuration of the arc gesture. The audio signal may be the audio indicator representing the most recent secondary content item or may be a fixed audio signal based on a type of secondary content item.

The device **110** may determine (**416**) a configuration of the arc gesture based on the first direction and the second direction. The device **110** may identify (**418**) secondary content item(s) corresponding to the arc gesture in response to the arc gesture, for example identifying the secondary content item associated with the most recent audio indicator output prior to detecting the arc gesture. Finally, the device **110** may output (**420**) additional information corresponding to the secondary content item(s) (such as audio associated with the secondary content item) in response to the arc gesture. As discussed above, the device **110** may output an audio signal and/or haptic feedback prior to outputting the additional information. For example, the audio signal may be the audio indicator representing the most recent secondary content item or may be a fixed audio signal based on a type of secondary content item.

If an exit gesture is detected, the device **110** may interrupt any of steps **412**, **414**, **416**, **418** and **420** and resume outputting (**410**) audio corresponding to the text segment. For example, upon detecting (**412**) the input, the device **110** may store a current moment within the first speech as a speech location and a current location within the text segment as a text location. Alternatively, after detecting (**412**) the input, interpreting (**414**) the input as the arc gesture, determining (**416**) the configuration of the arc gesture and identifying (**416**) the secondary content corresponding to the arc gesture, the device **110** may store a moment in the first speech of the audio indicator(s) associated with the secondary content item(s) as the speech location and may store a location of the secondary content item(s) in the text segment as the text location. After detecting the exit gesture, the device **110** may resume outputting (**410**) audio using the stored speech location and the stored text location. As an alternative, the device **110** may resume the audio at a point prior to the stored speech location and the stored text location, based on user preferences. For example, the device **110** may resume the audio at a beginning of the text segment associated with the stored text location or may resume the audio at a fixed interval, such as five seconds, prior to the stored speech location.

FIG. **4**B illustrates an example of a detailed flowchart for navigating secondary content using gestures. As illustrated in FIG. **4**B, the device **110** may determine (**430**) first speech corresponding to primary text in a text segment, the text segment including the primary text and secondary content associated with the text segment. Concurrently or subsequently to determination of the first speech, the device **110** may determine (**432**) audio indicator(s) representing secondary content item(s) at respective locations in the first speech based on location(s) of secondary content item(s) in the primary text. The device **110** may then output (**433**) the first speech and audio indicator(s). For example, the device **110** may output audio indicator(s) during output of the first speech, during pauses corresponding to the secondary content item(s) or indicators inserted within the output of the first speech, or within a time threshold of the output of the first speech. Steps **430**, **432** and **433** may correspond with any of the steps illustrated in FIGS. **2**A and **2**B without departing from the disclosure. As the device **110** performs steps **430**, **432** and **433**, the device **110** may track a current location in the primary text with a current moment in the first speech so that the device **110** may switch between the primary text and the first speech using the synchronized current location and the current moment.

The device **110** may detect (**434**) a first input within a time threshold of output of an audio indicator. The device **110** may detect the first input by detecting contact on a touchscreen, detecting motion of a subject using a camera, detecting motion of a subject using motion sensors, watches, accelerometers, muscle movements, electrical signal monitors or any other methods of detecting gestures known to one of skill in the art. After detecting the first input, the device **110** may interpret (**436**) the first input as a first arc gesture based on locations of a first point, a second point and a midpoint of the first input. One example of interpreting gestures is described in greater detail below with respect to FIG. **4**C. Based on detecting (**434**) the first input and/or interpreting (**436**) the first input as a first arc gesture, the device **110** may interrupt outputting (**433**) of the first speech and audio indicator(s). For example, the device **110** may stop outputting (**433**) the first speech and audio indicator(s) once the first input is detected (**434**) and may output an audio signal and/or haptic feedback as a notification that the device **110** interpreted (**436**) the first input as the first arc gesture. The audio signal may be the audio indicator representing the most recent secondary content item or may be a fixed audio signal based on a type of secondary content item.

If the first input is interpreted as the first arc gesture, the device **110** may identify (**438**) a secondary content item corresponding to the first arc gesture as a current secondary content item in response to the first arc gesture. For example, the device **110** may identify a secondary content item associated with the most recent audio indicator output prior to detecting the first arc gesture as the current secondary content item.

The device **110** may identify (**440**) supplemental text associated with a current secondary content item, may synthesize (**442**) the supplemental text to create second speech and may output (**444**) the synthesized second speech.

As an example of the device **110** synthesizing the second speech, the device **110** may generate speech data that is configured to be output as audio data by a speaker component, audio jack, communication equipment or any other audio output device known to one of skill in the art. As discussed above, the device **110** may output an audio signal and/or haptic feedback prior to outputting the synthesized second speech. For example, the audio signal may be the audio indicator representing the most recent secondary content item or may be a fixed audio signal based on type(s) of secondary content item(s). While this example includes synthesizing the supplemental text to create the second speech, the device **110** may identify existing second speech associated with the supplemental text instead. If the audio associated with the supplemental text is generated by a speech synthesizer, voice parameters of the speech synthesizer for the supplemental text may be different than the voice parameters of the speech synthesizer for the primary text. For example, the voice parameters may modify a character, tone, speed or pitch of a voice output by the speech synthesizer.

The device **110** may modify a virtual placement of audio in three-dimensional space. For example, a virtual placement of the audio indicator(s) in three-dimensional space may be different than a virtual placement of the first speech and/or second speech, the audio indicator(s) may modify a virtual placement of the voice output by the speech synthesizer and/or a virtual placement of the second speech may be different than a virtual placement of the first speech. The virtual placement may be based on a type of secondary content item(s), a location of the secondary content item(s) in the primary text or the document and/or other settings based on user preferences. As an example using the type of secondary content item(s), audio indicator(s) associated with a footnote may have a virtual placement on the left whereas audio indicator(s) associated with a comment may have a virtual placement on the right. As an example using the location of the secondary content item(s) in the text segment, audio indicator(s) associated with secondary content item(s) or indicators located within the primary text may have a virtual placement on the left whereas audio indicator(s) associated with secondary content item(s) located at the end of the primary text may have a virtual placement on the right. As an example of modifying a virtual placement of the voice output by the speech synthesizer, audio indicator(s) associated with highlighted text may modify the virtual placement of portions of first speech and/or second speech associated with the highlighted text relative to the virtual placement of the remaining first speech and/or second speech. As an example of different virtual placements of the first speech and the second speech, first speech may have a virtual placement on the left whereas second speech may have a virtual placement on the right. The disclosure is not limited thereto and the virtual placement of the voice output and/or the audio indicator(s) may be based on one or more factors selected based on user preferences.

At any point after detecting the first input, the device **110** may detect (**446**) an additional input corresponding to a gesture. As discussed above, the device **110** may detect the additional input by detecting contact on a touchscreen, detecting motion of a subject using a camera, detecting motion of a subject using motion sensors, watches, accelerometers, muscle movements, electrical signal monitors or any other methods of detecting gestures known to one of skill in the art. After detecting the additional input, the device **110** may interpret (**448**) the additional input as an additional arc gesture based on locations of a first point, a second point and a midpoint of the additional input. One example of interpreting gestures is described in greater detail below with respect to FIG. **4**C.

If the additional input is interpreted as the additional arc gesture, the device **110** may identify (**450**) additional secondary content item(s) corresponding to the additional arc gesture in response to the additional arc gesture. For example, the device **110** may identify an additional secondary content item or indicator located immediately before or after the current secondary content item or indicator(s) within the primary text. After identifying the additional secondary content item, the device **110** may loop (**452**) to step **440** and repeat steps **440**, **442**, **444** and/or **446** using the additional secondary content item as a current secondary content item. The device **110** may repeat steps **448** and **450** and continue to loop (**452**) until no additional input is detected before a time threshold is exceeded or an exit gesture is detected.

If an exit gesture is detected, the device **110** may interrupt output of the synthesized second speech and may output the first speech based on a moment of the first input in the first speech. For example, upon detecting (**434**) the first input, the device **110** may store a current moment within the first speech as a speech location and a current location within the text segment as a text location. Alternatively, after detecting (**434**) the first input, interpreting (**436**) the first input as the first arc gesture and identifying (**438**) the secondary content corresponding to the first arc gesture, the device **110** may store a moment of the audio indicator associated with the secondary content in the first speech as the speech location and may store a location of the secondary content in the text segment as the text location.

After detecting the exit gesture, the device **110** may resume playback of the first speech by performing steps **430**, **432** and **433** using the stored speech location and the stored text location. As an alternative, the device **110** may resume playback of the first speech at a point prior to the stored speech location and the stored text location, based on user preferences. For example, the device **110** may begin the first speech at a beginning of the text segment associated with the stored text location or may begin the first speech at a fixed interval, such as five seconds, prior to the stored speech location.

Using the method of navigating secondary content illustrated in the flowchart of FIG. **4**B, a user may hear an audio indicator corresponding to a secondary content item and request supplemental text associated with the secondary content item. The device **110** may detect the request and output audio corresponding to the supplemental text associated with the secondary content item. Using additional arc gestures, the user may navigate to next subsequent or next previous secondary content item(s) and request supplemental text associated with the next subsequent or next previous secondary content item(s). The device **110** may detect the additional arc gestures, identify the next subsequent or next previous secondary content item(s) and output audio corresponding to the supplemental text associated with the next subsequent or next previous secondary content item(s). In addition, the user may use additional arc gesture(s) to request that the second speech associated with the current secondary content item is repeated. The device **110** may detect the additional arc gesture(s) and output audio corresponding to the supplemental text associated with the current secondary content item. Once the user is finished with the supplemental text and the secondary content, the user may wait a desired amount of time or may make an exit gesture indicating to the device **110** to continue playback of

the first speech corresponding to the primary text in the text segment. The desired amount of time may be defined by user preferences and may have different values based on a type of secondary content or a level of secondary content. The exit gesture indicating to the device **110** to continue playback of the first speech may also be defined by user preferences. For example, the exit gesture may be defined as two fingers swiping down or other gestures known to one of skill in the art. The device **110** may detect the exit gesture or may determine that a time period has elapsed and may output audio including the first speech as discussed above.

FIG. **4**C illustrates an example of a detailed flowchart for interpreting an input as an arc gesture. First, the device **110** may detect (**460**) that an input is initiated at a first point. For example, the device **110** may detect that a hand **145** contacts a touchscreen **114** of the device **110** at a first point, such as the left side of the touchscreen. If the input device is a camera or other device that continually detects a subject, the device **110** may determine the first point based on a lack of movement of the subject during a time threshold or by other methods known to one of skill in the art. For example, the device **110** may identify a local maximum or local minimum of the input in the horizontal direction as the first point.

The device **110** may then detect (**462**) that the input is terminated at a second point. For example, the device **110** may detect that the hand continues to contact the touchscreen **114** while moving in a positive vertical arcing motion from the first point to a second point on the right side of the touchscreen **114**, at which point the device **110** does not detect further contact between the hand and the touchscreen **114**. Alternatively, if the input device is the camera or other device that continually detects the subject, the device **110** may detect that the subject moves in a positive vertical arcing motion from the first point to a second point and may determine the second point based on a lack of movement of the subject during a time threshold or by other methods known to one of skill in the art. For example, the device **110** may identify a local maximum or local minimum of the input in the horizontal direction, opposite the first point, as the second point.

The device **110** may determine (**463**) that a velocity of the input exceeds a threshold. For example, the input may result from inadvertent contact or be contact made without intending to be the arc gesture. These unintentional inputs may be slow-moving, having a low velocity or a long period of time between the first point and the second point. To filter unintentional inputs and reduce or prevent the device **110** from interrupting the first speech accidentally, the device **110** may determine that the velocity of the input exceeds the threshold for the input to be interpreted as the arc gesture. The device **110** may set the threshold so that any concerted movement or deliberate input may exceed the threshold.

After detecting the first point and the second point, the device **110** may determine (**464**) an appropriate midpoint between the first point and the second point. For example, by comparing vertical coordinates between the first point and the second point to a first vertical coordinate of the first point, the device **110** may locate a local maximum and use this as the midpoint. The midpoint may be used to determine if the input exceeds a vertical threshold to assist the device **110** in differentiating between a horizontal swipe gesture and an arc gesture. Therefore, identifying the local maximum or minimum in the vertical direction as the midpoint is beneficial to detecting if the input is an arc gesture. However, the midpoint is not limited to the local maximum or local minimum and may be any point between the first point and the second point. For example, the device **110** may determine a horizontal coordinate roughly halfway between the first point and the second point and may use the corresponding vertical coordinate as the midpoint.

The device **110** may determine (**466**) if the input exceeds a horizontal threshold. For example, the device **110** may calculate a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point and compare the difference to a desired horizontal threshold. Similarly, the device **110** may determine (**468**) a horizontal direction of the second point with respect to the first point. For example, the device **110** may determine that the input traveled in a left to right motion by comparing the horizontal coordinates of the first point and the second point. If the second point is to the right of the first point on an x axis of the touchscreen **114**, then the second horizontal coordinate is greater than the first horizontal coordinate and the difference between the first horizontal coordinate and the second horizontal coordinate may be in the positive x direction. Thus, the device **110** may interpret the input as having a left to right motion.

The device **110** may also determine (**470**) if the input exceeds a vertical threshold. For example, the device **110** may calculate a difference between the first vertical coordinate associated with the first point and a second vertical coordinate associated with the midpoint and compare the difference to a desired vertical threshold. As discussed in greater detail with regard to FIG. **3**A, the thresholds may be an absolute value or a relative value or desired ratio between the vertical distance and the horizontal distance. Similarly, the device **110** may determine (**472**) a vertical direction of the midpoint with respect to the first point. For example, the device **110** may use the vertical coordinates of the first point and the midpoint to determine if the input was in a positive vertical direction or a negative vertical direction. If the second vertical coordinate is greater than the first vertical coordinate on a y axis of the touchscreen **114**, the midpoint is above the first point and the device **110** may determine that the vertical difference between the first vertical coordinate and the second vertical coordinate is in the positive y direction.

If the input exceeds the horizontal threshold and the vertical threshold, the device **110** may determine (**474**) a configuration of the arc gesture based on the horizontal direction of the second point with respect to the first point and the vertical direction of the midpoint with respect to the first point. Thus, the device **110** may identify if the input is an arc gesture and if the input corresponds to the first configuration illustrated in FIG. **3**A, the second configuration illustrated in FIG. **3**B, the third configuration illustrated in FIG. **3**C or the fourth configuration illustrated in FIG. **3**D.

FIG. **5**A illustrates an example of a new hierarchy navigational gesture to navigate between different levels of secondary content or different menu items. For example, instead of navigating amongst secondary content items on a similar level, the hierarchy navigation gesture may be used to cycle between a lower level of secondary content and a higher level of secondary content. For example, secondary content may be organized in a hierarchy with nested secondary content providing additional information related to a particular secondary content item. As a first example, a higher level secondary content may be a footnote related to a historic event, and lower level secondary content may include several secondary content items providing additional information regarding the historic event. The gestures illustrated in FIG. **3**A-**3**D may navigate amongst the several secondary content items, whereas the new hierarchy navigational gesture may navigate between the higher level

secondary content (footnote) and the lower level secondary content (several secondary content items). As a second example, higher level secondary content may be a first type of secondary content and lower level secondary content may be a second type of secondary content. The gestures illustrated in FIG. **3**A-**3**D may navigate amongst the higher level secondary content items or the lower level secondary content items, whereas the new hierarchy navigational gesture may navigate between the higher level secondary content (first type of secondary content) and the lower level secondary content (second type of secondary content). However, the disclosure is not limited to navigating amongst secondary content. For example, the gestures may navigate amongst menu items (including nested menu items) or electronic content (such as navigating between chapters, sections and/or paragraphs within an electronic document) without departing from the present disclosure.

As illustrated in FIG. **5**A, the device **110** may interpret contact as the gesture **520** if the contact begins at an initial position and travels to a final position along a spiraling arc. For example, the hand **525** may begin at the initial position on the left side of the device **110** and travel along both a horizontal axis of the device **110** and a vertical axis of the device **110** to the final position on the right side of the device **110** after completing a full revolution. Thus, the spiraling arc may be separated into two separate motions; a circle motion followed by the arc motion described above with respect to FIGS. **3**A-**3**D. In addition, the circle motion may be broken into two arc motions described above with respect to FIGS. **3**A-**3**D.

As an example using a touchscreen **114**, the hand **525** may create the gesture **520** by contacting the device **110** at an initial position (first point **511**) and traveling in an arc motion in the positive vertical direction from the first point **511** to a second point **512**. Subsequently, as part of the same motion, the hand **525** may continue from the second point **513** and travel in an arc motion in the negative vertical direction to a third point **515** located near the first point **511**. Finally, as part of the same motion, the hand **525** may continue from the third point **515** and travel in the positive vertical direction to the final position (fourth point **517**) located near the second point **513**.

To detect the gesture **520**, the device **110** detects a continuous motion from the first point **511** to the second point **513**, the third point **515** and the fourth point **517**. However, while the first point **511** corresponds to the initial contact between the hand **525** and the device **110** and the fourth point **517** corresponds to the final position prior to contact ending between the hand **525** and the device **110**, the second point **513** and the third point **515** are midpoints that are determined by the device **110**. In one example, the device **110** may determine which coordinates along the contact correspond to the second point **513** and the third point **515** by finding a local maximum and a local minimum in the horizontal direction between the first point **511** and the fourth point **517**. For example, the second point **513** may have a maximum horizontal coordinate and the third point **515** may have a minimum horizontal coordinate. While FIG. **5** illustrates the first point **511**, the second point **513**, the third point **515** and the fourth point **517** having a substantially similar vertical coordinate, the vertical coordinate associated with each may vary without departing from the present disclosure. For example, the device **110** may detect the gesture **520** regardless of variations between each of the vertical coordinates associated with the first point **511**, the second point **513**, the third point **515** and the fourth point **517**, provided the contact exceeds the requisite vertical thresholds.

In order to determine that the continuous motion corresponds to the gesture **520**, the device **110** may split the continuous motion into three discrete segments encompassing three separate arc motions. Each of the arc motions may be determined as discussed above with regard to FIGS. **3**A-**3**D. For example, the device **110** may detect a first arc motion between the first point **511** and the second point **513**, a second arc motion between the second point **513** and the third point **515**, and a third arc motion between the third point **515** and the fourth point **517**.

To detect the first arc motion, the device **110** may determine a first midpoint **512** having a maximum vertical coordinate between the first point **511** and the second point **513**. Similarly, to detect the second arc motion the device **110** may determine a second midpoint **514** having a minimum vertical coordinate between the second point **513** and the third point **515**. Finally, to detect the third arc motion the device **110** may determine a third midpoint **516** having a maximum vertical coordinate between the third point **515** and the fourth point **517**.

To detect the first arc motion, the device **110** may determine that a distance between a first horizontal coordinate associated with the first point **511** and a second horizontal coordinate associated with the second point **513** exceeds a horizontal threshold. Similarly, the device **110** may determine that a difference between a first vertical coordinate associated with the first point **511** and a second vertical coordinate associated with the first midpoint **512** exceeds a vertical threshold.

To detect the second arc motion, the device **110** may determine that a distance between the second horizontal coordinate associated with the second point **513** and a third horizontal coordinate associated with the third point **515** exceeds a horizontal threshold. Similarly, the device **110** may determine that a difference between a third vertical coordinate associated with the second point **513** and a fourth vertical coordinate associated with the second midpoint **514** exceeds a vertical threshold.

To detect the third arc motion, the device **110** may determine that a distance between the third horizontal coordinate associated with the third point **515** and a fourth horizontal coordinate associated with the fourth point **517** exceeds a horizontal threshold. Similarly, the device **110** may determine that a difference between a fifth vertical coordinate associated with the third point **515** and a sixth vertical coordinate associated with the third midpoint **516** exceeds a vertical threshold.

Each of the first arc motion, the second arc motion and the third arc motion may be detected according to the methods described above with regard to FIGS. **4**A-C. In addition, the method may be applicable to location data from any input device and the disclosure is not limited to the touchscreen **114**. Examples of input devices may include a touchscreen, a camera, motion sensors or other devices configured to detect gestures. Use of other input devices may require additional steps to detect the gesture **520**, such as the steps concerning input devices that continually detect a subject outlined above with regard to FIGS. **4**A-C.

While FIG. **5**A illustrates contact traveling 540°, the device **110** may interpret contact as the gesture **520** if the contact travels anywhere from about 360° to about 720° without departing from the present disclosure. For example, the initial contact may occur at the location of the first midpoint **512** and the contact may continue to the fourth

point **517** for a total of 450°. In this example, the device **110** may determine the first point **511** as the point of initial contact and may determine the first midpoint **512** as being located at a point halfway between horizontal coordinates of the first point **511** and the second point **513**. Alternatively, the device **110** may rotate each of the first point **511**, the first midpoint **512**, the second point **513**, the second midpoint **514** and the third point **515** by 90° relative to FIG. **5**A and may calculate the third midpoint **516** as being located at a point halfway between horizontal coordinates of the third point **515** and the fourth point **517**.

While FIG. **5**A illustrates the hierarchy navigational gesture configured in a positive direction (left to right), the hierarchy navigational gesture may be configured in a negative direction (right to left) instead. Using the same steps detailed above, the device **110** may determine a first point (on the right) and a fourth point (on the left) and separate the input into a first arc motion, a second arc motion and a third arc motion. Similarly, while the hierarchy navigational gesture is illustrated in FIG. **5**A as having a clockwise orientation, the hierarchy navigational gesture may have a counter-clockwise orientation. Thus, like gestures **320**, **330**, **340** and **350** illustrated in FIGS. **3**A-**3**D, the hierarchy navigational gesture may be used in one of four configurations and each configuration may be mapped to a different result. For example, each configuration may be mapped or assigned to a different input or button in an operating system on the device **110**.

Similarly, instead of left to right or right to left, the hierarchy navigational gesture may be configured in a top to bottom or bottom to top configuration by having the spiral begin at the top or bottom of the screen. For example, an input may begin a spiral with a first point at the top of the screen (where the third midpoint **516** is located in FIG. **5**A) and a second point at the bottom of the screen (where second midpoint **514** is located in FIG. **5**A) or vice versa. The same steps may apply to both left to right and top to bottom configurations by rotating individual steps by 90°. For example, instead of determining a midpoint based on a maximum or minimum vertical coordinate, the device **110** may determine a midpoint based on a maximum or minimum horizontal coordinate. Similarly, the vertical threshold may be determined by a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with the second point, whereas the horizontal threshold may be determined by a difference between the first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the midpoint.

FIG. **5**B illustrates an example of a detailed flowchart for navigating between different levels of secondary content or different menu items. The device **110** may detect (**550**) initial contact at a first point **511** and detect (**552**) termination of contact at a fourth point **517**. From the first point **511** and the fourth point **517**, the device **110** may determine (**554**) a second point **513** and a third point **515** by finding a local maximum and a local minimum in the horizontal direction between the first point **511** and the fourth point **517**. The device **110** may then separate (**556**) the contact into three discrete arc segments encompassing a first arc motion, a second arc motion and a third arc motion. The device **110** may determine (**558**) midpoints **512**, **514**, **516** for the first arc motion, the second arc motion and/or the third arc motion. Using the methods discussed above with regard to FIGS. **4**A-C, the device **110** may analyze (**560**) the first arc motion using the first point **511**, the second point **513** and the first midpoint **512**, analyze (**562**) the second arc motion using the second point **513**, the third point **515** and the second midpoint **514** and analyze (**564**) the third arc motion using the third point **515**, the fourth point **517** and the third midpoint **516**. The device **110** may determine (**566**) a configuration of the hierarchical navigational gesture by comparing the first point **511** to the fourth point **517** and the first point **511** to the first midpoint **512**. If the device **110** determines that the first arc motion, the second arc motion and the third arc motion all exceed the respective horizontal and vertical thresholds, the device **110** may navigate (**568**) to a higher/lower level in the menu system based on the configuration of the hierarchical navigational gesture.

FIGS. **6**-**8** illustrate several types of secondary content that may be included in an electronic book displayed on an electronic device. These illustrations are provided as examples and are not intended to be comprehensive. The disclosure is intended to include all secondary content, supplemental content or other additional information that is tangential to the primary text of the electronic book.

FIG. **6** illustrates a device **110** displaying an electronic book **602** with secondary content that includes comprehension guides displayed as in line parentheticals. While this example illustrates the text of the book as being in English, the language may vary without departing from the disclosure. As illustrated in FIG. **6**, the ebook **602** includes primary text **604** and secondary content **606**. In this particular example, the secondary content **606** may be foreign translations of particular words within the primary text separated by parentheses. This type of secondary content may be helpful to enable non-English speaking users to understand difficult English words.

In one aspect, the secondary content may be provided as part of the document, for example, translations that are incorporated into a learning text as part of the original ebook. In another aspect, the secondary content may be created dynamically. For example the system **100**/device **110** may operate an application that processes primary text and compares it to a level of a user's language understanding. For words that may be difficult for the user, the system may obtain potential translations, which are then displayed on the device as secondary content (i.e., the translation(s)) proximate to the primary text (i.e., the word(s) being translated). Other dynamic systems of creating secondary content may also be used.

In this example, when the device **110** synthesizes the primary text **604**, the device **110** may insert audio indicator(s) at the location(s) of item(s) of secondary content **606** within the primary text **604**. If the device **110** detects a first gesture (or other command to access the secondary content item), the device **110** may synthesize speech for the text of secondary content item **606** (which is associated with the most recent output audio indicator) and output the synthesized speech of the secondary content item.

If the device **110** detects a second gesture, the device **110** may skip to previous secondary content item(s) or subsequent secondary content item(s), depending on the direction of the second gesture. Similarly, each time the device **110** detects the second gesture, the device may skip to the next previous secondary content item or the next subsequent secondary content item from the current secondary content item, allowing the user to navigate the secondary content items.

FIG. **7** illustrates a device **110** displaying an electronic book **702** with secondary content **706** that includes comprehension guides organized as footnotes **708**. As illustrated in FIG. **7**, the ebook **702** may include primary text **704** and multiple footnotes **708** that are detailed in the secondary

content **706** section at the bottom of the page. In the alternative, the multiple footnotes **708** may be generated by the system and/or device to offer additional functionality/features to supplement the primary text **704**. While this particular example illustrates translations of individual words as the footnotes **708**, the disclosure is not limited and the footnotes **708** may include any additional information relevant to the primary text **704**.

In this example, when the device **110** synthesizes the primary text **704**, the device **110** may insert audio indicator(s) at respective location(s) of textual footnote indicator(s) within the primary text **704**, for example at location **710** for footnote **1**. If the device **110** detects a first gesture, the device **110** may synthesize speech corresponding to the text of the corresponding footnote **708** located in the secondary content **706** at the bottom of the page and may output the synthesized speech.

FIG. **8** illustrates a device **110** displaying an electronic book **802** with comprehension guides displayed above the corresponding word of the text as secondary content **806**. As illustrated in FIG. **8**, the ebook **802** may include primary text **804** with the secondary content **806** section above the corresponding word or the secondary content **806** may be generated by the system/device. As discussed above, while the secondary content **806** in this particular example consists of translations of individual words, the disclosure is not limited thereto and the secondary content **806** may include any additional information relevant to the primary text **804**, such as synonyms or other content.

In this example, when the device **110** synthesizes the primary text **804**, the device **110** may insert audio indicator(s) at the location(s) of item(s) of secondary content **806** within the primary text **804**. If the device **110** detects a first gesture, the device **110** may synthesize the text of the corresponding secondary content item **806** and may output the synthesized text, for example as audio.

Of course, the examples shown in FIGS. **6-8** are non-limiting and secondary content may include any additional information and may be utilized and displayed in any number of ways.

FIGS. **9**A and **9**B illustrate block diagrams conceptually illustrating components of a system **900** including one or more of an electronic device **910** and a remote server **912**. Depending upon how the system is structured, some of the components illustrated in FIG. **9**A as part of the device **910** or in FIG. **9**B as part of the remote server **912** may be included only in the device **910** or in the server **912**, or may be distributed across multiple devices **910** and/or servers **912**. Other components not illustrated may also be included in the device **910** and/or the server **912**. In operation, the system **900** may include computer-readable and computer-executable instructions that reside in storage **908** on the device **910** and/or server **912**. The device **910** may be a computer, set-top box or a portable device, such as an electronic reader, a smart phone, tablet, smart watch, or the like. The server **912** may be a single server or a group of servers.

The teachings of the present disclosure may be applied within a number of different devices and computer systems, including, for example, general-purpose computing systems, server-client computing systems, mainframe computing systems, telephone computing systems, laptop computers, cellular phones, personal digital assistants (PDAs), tablet computers, other mobile devices, etc. The device **910** may also be a component of other devices or systems that may provide speech processing functionality, such as automated teller machines (ATMs), kiosks, home appliances (such as refrigerators, ovens, etc.), vehicles (such as cars, buses, motorcycles, etc.), and/or exercise equipment, for example.

The device **910** and/or server **912** may include one or more controllers/processors **904** comprising one-or-more central processing units (CPUs) for processing data and computer-readable instructions, and a memory **906** for storing data and instructions. The memory **906** may include volatile random access memory (RAM), non-volatile read only memory (ROM), non-volatile magnetoresistive (MRAM) and/or other types of memory. The device **910** and/or server **912** may also include a data storage component **908** for storing data and processor-executable instructions. The data storage component **908** may include one or more non-volatile storage types such as magnetic storage, optical storage, solid-state storage, etc. The device **910** and/or server **912** may also be connected to a removable or external non-volatile memory and/or storage (such as a removable memory card, memory key drive, networked storage, etc.) through the input/output device interfaces **902**.

Executable instructions for operating the device **910** and/or server **912** and their various components may be executed by the controller(s)/processor(s) **904**, using the memory **906** as temporary "working" storage at runtime. The executable instructions may be stored in a non-transitory manner in non-volatile memory **906**, storage **908**, or an external device. Alternatively, some or all of the executable instructions may be embedded in hardware or firmware in addition to or instead of software.

As shown in FIG. **9**A, the device **910** may include one or more of a variety of sensors. Among the sensors are an audio capture component such as microphone(s) **913**, an image and/or video capture component such as camera(s) **916**, a touch interface **914**, an antenna **922**, global positioning sensors **962**, field sensors **964** (e.g., a 3-axis magnetometer, a gravity sensor), and inertial sensors **966** (e.g., a 3-axis accelerometer, a 3-axis gyroscope). The device **910** may also include one or more buttons (not shown) or other input components such as a keyboard (not shown). Several of each of these components may be included. Also, although shown as integrated within device **910**, some or parts of the various sensors may be external to device **910** (such as wireless headset **1004**, wired headset **1006** or smartwatch **1008** in FIG. **10**, etc.) and accessed through input/output device interfaces **902** either wirelessly or through a physical connection. The sensors may produce output data that may be used in determining movement signatures, as explained below.

The antenna **922** and related components (e.g., radio transmitter/receiver/transceiver, modem, etc.) may be configured to operate with a network **901**, for example a wireless local area network (WLAN) (such as WiFi), Bluetooth, and/or wireless networks, such as a Long Term Evolution (LTE) network, WiMAX network, 3G network, etc.

The audio capture component may be, for example, a microphone **913** or array of microphones, a wired headset (e.g. wired headset **1006** in FIG. **10**), a wireless headset (e.g., wireless headset **1004** in FIG. **10**), etc. If an array of microphones is included, an approximate distance to a sound's point of origin may be determined using acoustic localization based on time and amplitude differences between sounds captured by different microphones of the array.

The touch interface **914** may be integrated with a surface of a display **911** or may be separate (e.g., a touch pad). The touch interface may be of any technology such as capacitive, resistive, optical/infrared, thermal/temperature, piezoelec-

tric, etc. Other pointing devices for interacting with a graphical user interface (GUI) may be included, such as a touchpad, a trackball, or a mouse.

The global positioning module **962** provides an interface for acquiring location information, such as information from satellite geographic positioning system(s). For example, the global positioning module **962** may include a Global Positioning System (GPS) receiver and/or a Global Navigation Satellite System (GLONASS) receiver. The global positioning module **962** may also acquire location-based information using other radio sources (e.g., via antenna **922**), such as mapping services that triangulate off of known WiFi service set identifiers (SSIDs) or cellular towers within range of the device **910**.

The field sensor module **964** provides directional data. The field sensor module **964** may include a 3-axis magnetometer that measures magnetic fields and may serve as a compass. The field sensor module **964** may also include a dedicated gravity sensor to determine up-and-down. The inertial sensor module **966** provides inertial data, and may include 3-axis accelerometer and a 3-axis gyroscope. Examples of other sensors include an electronic thermometer to measure ambient temperature and a proximity sensor to detect whether there is an object within a certain distance of the device **910**.

Sensors may be communicatively coupled with other components of device **910** via input/output (I/O) device interfaces **902** and/or via an address/data bus **924**. The address/data bus **924** conveys data among components of the device **910** and/or server **912**. Each component within the device **910** and/or server **912** may also be directly connected to other components in addition to (or instead of) being connected to other components across the bus **924**.

The I/O device interfaces **902** may connect to a variety of components and networks. Among other things, the I/O device interfaces **902** may include an interface for an external peripheral device connection such as universal serial bus (USB), FireWire, Thunderbolt or other connection protocol. The input/output device interfaces **902** may also support a variety of networks via an Ethernet port and antenna **922**. Examples of other I/O devices may include motion sensors, smartwatches, accelerometers, muscle movement/electrical signal monitors or any other devices configured to detect movement and/or gestures.

The device **910** may also include a video output component for displaying images, such as display **911**. The video output component may be a display of any suitable technology, such as a liquid crystal display, an organic light emitting diode display, electronic paper, an electrochromic display, a pico projector, etc. The video output component may be integrated into the device **910** or may be separate.

The device **910** may also include an audio output component such as a speaker **918**, a wired headset (e.g. wired headset **1006** in FIG. **10**), or a wireless headset (e.g., wireless headset **1004** in FIG. **10**). Other output devices include a haptic effect generator (not illustrated). The haptic effect generator may be of any haptic technology, including technologies to vibrate the entire device **910** (e.g., electromagnetic technologies such as vibratory motor or a coil with a central mass) and/or may comprise technologies allowing the haptic effect to be localized to a position of the touch interface **914**, such as electroactive polymers, piezoelectrics, electrostatics, subsonic audio wave surface actuation, etc.

As discussed above, device **910** and/or server **912** includes controller(s)/processors **904**, memory **906**, and storage **908**. In addition, the device **910** and/or server **912** may include a speech synthesizer module **940** and a gesture interpretation module **944**, each of which may comprise processor-executable instructions stored in storage **908** to be executed by controller(s)/processor(s) **904** (e.g., software, firmware), hardware, or some combination thereof For example, components of the speech synthesizer module **940** and the gesture interpretation module **944** may be part of a software application running in the foreground and/or background on the device **910**. In another example, a gesture interpretation module **944** may reside on a device **910** whereas a speech synthesizer module **940** may reside on server **912**. Other configurations are also possible.

The speech synthesizer module **940** may be configured to receive various inputs having text and may analyze the text in order to synthesize the text and generate speech. Text received by the speech synthesizer module **940** may be received by a front-end for processing. The front-end may be included in the speech synthesizer module **940**. The front-end may include modules for performing text normalization, linguistic analysis, and linguistic prosody generation. During text normalization, the front-end processes the text input and generates standard text, converting such things as numbers, abbreviations (such as Apt., St., etc.), symbols ($, %, etc.) into the equivalent of written out words.

During linguistic analysis the front end analyzes the language in the normalized text to generate a sequence of phonetic units corresponding to the input text. This process may be referred to as phonetic transcription. Phonetic units include symbolic representations of sound units to be eventually combined and output as speech. Various sound units may be used for dividing text for purposes of speech synthesis. The speech synthesizer module **940** may process speech based on phonemes (individual sounds), half-phonemes, di-phones (the last half of one phoneme coupled with the first half of the adjacent phoneme), bi-phones (two consecutive phonemes), syllables, words, phrases, sentences, or other units. Each word may be mapped to one or more phonetic units. Such mapping may be performed using a language dictionary. The linguistic analysis performed may also identify different grammatical components such as prefixes, suffixes, phrases, punctuation, syntactic boundaries, or the like. Such grammatical components may be used by the speech synthesizer module **940** to craft a natural sounding audio waveform output. The language dictionary may also include letter-to-sound rules and other tools that may be used to pronounce previously unidentified words or letter combinations that may be encountered by the speech synthesizer module **940**. Generally, the more information included in the language dictionary, the higher quality the speech output.

Based on the linguistic analysis the front end may then perform linguistic prosody generation where the phonetic units are annotated with desired prosodic characteristics, also called acoustic features, which indicate how the desired phonetic units are to be pronounced in the eventual output speech. During this stage the front end may consider and incorporate any prosodic annotations that accompanied the text input to the speech synthesizer module **940**. Such acoustic features may include pitch, energy, duration, tone, and the like. Application of acoustic features may be based on prosodic models available to the speech synthesizer module **940**. Such prosodic models indicate how specific phonetic units are to be pronounced in certain circumstances. A prosodic model may consider, for example, linguistic features such as a phoneme's position in a syllable, a syllable's position in a word, a word's position in a sentence or phrase, neighboring phonetic units, the phoneme's part of speech, etc. As with the language dictionary,

prosodic model with more information may result in higher quality speech output than prosodic models with less information.

The output of this processing, referred to as a symbolic linguistic representation, may include a sequence of phonetic units annotated with prosodic characteristics. This symbolic linguistic representation may be sent to a speech synthesis engine (also known as a synthesizer) included in the speech synthesizer module **940**, for conversion into an audio waveform of speech for eventual output. The symbolic linguistic representation may include textual indicators corresponding to secondary content as described above. These textual indicators may be formatted according to a speech synthesis markup language (SSML). These textual indicators may be processed by the speech synthesizer module **940** to insert audio indicators in the output speech.

Actual speech synthesis may be performed in a number of ways. In one way, called parametric synthesis, various speech parameters may be used to create audio using a machine voice synthesizer, called a vocoder. Another technique called unit selection, is more processor/memory/computing-resource intensive, however it produces more natural sounding speech. During unit selection, the speech synthesizer module **940** matches a database of recorded speech (called a voice corpus) against the symbolic linguistic representation of incoming text, such as a symbolic linguistic representation created by a front end, discussed above.

The voice corpus may include many hours of recorded speech (in the form of audio waveforms, feature vectors, or other formats), which may occupy a significant amount of storage. The recorded speech is typically divided into small segments called unit samples or units. The unit samples may be classified in a variety of ways including by phonetic unit (phoneme, diphone, triphone, word, etc.), linguistic prosodic label, acoustic feature sequence, speaker identity, etc. Each unit includes an audio waveform corresponding with a phonetic unit, such as a short audio segment of the specific sound, along with a description of the various acoustic features associated with the .wav file (such as its pitch, energy, etc.), as well as other information, such as where the phonetic unit appears in a word, sentence, or phrase, the neighboring phonetic units, etc. The voice corpus may include multiple examples of phonetic units to provide the TTS system with many different options for concatenating units into speech. Generally the larger the voice corpus, the better the speech synthesis may be achieved by virtue of the greater number of unit samples that may be selected to form the precise desired speech output.

Using all the information in the voice corpus, the speech synthesizer module **940** may match units of the voice corpus to the symbolic linguistic representation of input text (including both phonetic units and prosodic annotations). Matching units are selected and concatenated together to create a natural sounding waveform for the speech output.

The speech synthesizer module **940** may insert pauses in the synthesized speech at location(s) of secondary content item(s) and may insert audio indicator(s) corresponding to the secondary content item(s). Indicators for these pauses may be included in the symbolic linguistic representation discussed above and may be converted to pauses during speech synthesis. In certain embodiments, operations of the speech synthesizer module **940** may be performed remotely. For example, if a first speech synthesizer module **940** is located on a remote server **912**, the first speech synthesizer **940** on the remote server **912** may output analyzed text (such as a symbolic linguistic representation) to a second speech synthesizer **940** on a local device **910**. Thus, instead of streaming the generated audio, the remote server **912** may stream the analyzed text and reduce a bandwidth requirement for the local device **910**.

The gesture interpretation module **944** may be configured to receive various inputs, such as location data of a subject from a touchscreen, a camera, a motion detector or other device and to interpret the location data of the subject as being a desired gesture. For example, the gesture interpretation module **944** may receive location data from a touchscreen that corresponds to contact between the user and the touchscreen. Based on the location data, the gesture interpretation module **944** may identify a desired gesture and output a command based on the desired gesture.

The speech synthesizer module **940** and the gesture interpretation module **944** may be connected to the bus **924**, input/output interfaces **902**, controller/processor **904**, and/or other component of the device **910** and/or server **912**. For example, text sent to the speech synthesizer module may come from the storage **908** or the input/output interfaces **902**, such as text data sent to the device **910** and/or server **912** over a network. Data sent to the gesture interpretation module **944** may come from the input/output interfaces **902**, such as location data captured by the touch interface **914** and/or the camera(s) **916**, as well as any other component located in the device **910**.

As shown in FIG. **10**, multiple devices may be connected over a network **901**. The network **901** may include a local or private network or may include a wide network such as the internet. Devices may be connected to the network **901** through either wired or wireless connections. For example, a smart phone **910***a* may be connected to the network **901** through a wireless service provider, over a WiFi connection, and/or the like. Other devices, such as desktop computer **910***b* and/or server **912**, may connect to the network **901** through a wired connection. Other devices, such as laptop computer **910***c*, tablet computer **910***d* or set top box **910***e* may be capable of connection to the network **901** using various connection methods including through a wireless service provider, over a WiFi connection, or the like. The tablet computer **901***d* may be coupled to a smartwatch **1008** configured to detect gesture(s) and provide location data and/or movement data corresponding to the gesture(s) to the tablet computer **910***d*. The tablet computer **910***d* may receive the location data and/or movement data from the smartwatch **1008** and may interpret the location data and/or movement data as one or more gestures. Networked devices may output spoken audio through a number of audio output devices including through headsets **1004** or **1006**. Audio output devices may be connected to networked devices either through a wired or wireless connection. Networked devices may also include embedded audio output devices, such as an internal speaker (not pictured) in laptop computer **910***c*, smart phone **910***a*, or tablet computer **910***d*.

In certain speech synthesizing system configurations, one device may perform some or all of the speech synthesizing and other device(s) may perform the remaining speech synthesizing and/or output audio signals. For example, a server **912** may perform text analysis and linguistic analysis on a text segment having secondary content item(s), may generate waveforms to create synthesized speech and may output the synthesized speech over the network **901** to a tablet computer **910***d*. The tablet computer **910***d* may output audio including the speech callback(s) and/or the audio indicator(s) at respective locations in the synthesized speech based on a location of the corresponding secondary content item(s) in the text. Alternatively, to reduce a size of the data

being transmitted from the server **912**, the server **912** may perform text analysis and linguistic analysis on the text segment having secondary content item(s) and may output the analyzed text, along with optional speech callback(s) and/or audio indicator(s), over the network **901** to a laptop computer **910***d*. The laptop computer **910***c* may generate waveforms to create synthesized speech and may output audio including the speech callback(s) and/or the audio indicator(s) at respective locations in the synthesized speech based on a location of the corresponding secondary content item(s) in the text.

Because speech processing may involve significant computational resources, in terms of both storage and processing power, such split configurations may be employed where the device outputting the audio has lower processing capabilities than a remote device and/or higher quality results are desired. Thus, remote devices such as the server **912** may perform some or all of the speech synthesizing process to reduce the processor-intensive steps performed on the local device **910**. As a result, the speech synthesizing and/or audio data may be of higher quality using the server **912** or may reduce the processing requirements of the local device **910** without lowering the quality of the speech synthesizing and/or the audio data. Further, the amount of processing performing by the server **912** may be adjusted to reduce a bandwidth requirement of streaming the data from the server **912** to the local device **910**.

The above aspects of the present disclosure are meant to be illustrative. They were chosen to explain the principles and application of the disclosure and are not intended to be exhaustive or to limit the disclosure. Many modifications and variations of the disclosed aspects may be apparent to those of skill in the art.

Aspects of the present disclosure may be implemented as a computer implemented method, a system, or as an article of manufacture such as a memory device or non-transitory computer readable storage medium. The computer readable storage medium may be readable by a computer and may comprise instructions for causing a computer or other device to perform processes described in the present disclosure. The computer readable storage medium may be implemented by a volatile computer memory, non-volatile computer memory, hard drive, solid state memory, flash drive, removable disk, and/or other media.

Aspects of the present disclosure may be performed in different forms of software, firmware, and/or hardware. Further, the teachings of the disclosure may be performed by an application specific integrated circuit (ASIC), field programmable gate array (FPGA), or other component, for example.

Aspects of the present disclosure may be performed on a single device or may be performed on multiple devices. For example, program modules including one or more components described herein may be located in different devices and may each perform one or more aspects of the present disclosure. As used in this disclosure, the term "a" or "one" may include one or more items unless specifically stated otherwise. Further, the phrase "based on" is intended to mean "based at least in part on" unless specifically stated otherwise.

What is claimed is:

1. A computer-implemented method for navigating secondary content during a text-to-speech process, the method comprising:

outputting first audio including an audio tone preceded by first synthesized speech and followed by second synthesized speech, the audio tone corresponding to an indicator of a first footnote located in a string of text, the first synthesized speech associated with a portion of the string of text prior to the indicator and the second synthesized speech associated with a portion of the string of text following the indicator;

detecting first contact on a touch-screen of a computing device within a first period of time following output of the audio tone;

determining that the first contact corresponds to a predefined first arc gesture, the first contact extending along both a horizontal axis and a vertical axis from a first point to a second point, a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeding a horizontal threshold in a first direction relative to the first point, and a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the contact exceeding a vertical threshold;

selecting the first footnote in response to the first arc gesture;

identifying supplemental text associated with the first footnote; and

outputting third synthesized speech corresponding to the supplemental text associated with the first footnote.

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

detecting second contact on a touch-screen of a computing device within a second period of time following the first arc gesture;

determining that the second contact corresponds to a predefined second arc gesture, the second contact extending along both a horizontal axis and a vertical axis from a third point to a fourth point, a difference between a third horizontal coordinate associated with the third point and a fourth horizontal coordinate associated with the fourth point exceeding a horizontal threshold in a second direction relative to the third point, and a difference between a third vertical coordinate associated with the third point and a fourth vertical coordinate associated with a midpoint of the contact exceeding a vertical threshold;

identifying a second footnote in the string of text prior to the first footnote, in response to the second arc gesture;

identifying supplemental text associated with the second footnote in response to the second arc gesture; and

outputting fourth synthesized speech corresponding to the supplemental text associated with the second footnote in response to the second arc gesture.

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

generating the third synthesized speech corresponding to the supplemental text, the third synthesized speech having different voice parameters than at least one of the first synthesized speech and the second synthesized speech.

4. A computer-implemented method comprising:

outputting first audio including an audio tone preceded by first synthesized speech and followed by second synthesized speech, the audio tone associated with an indicator of first secondary content located in a string of text and based on a type of the first secondary content, the first synthesized speech associated with a portion of the string of text prior to the indicator and the second synthesized speech associated with a portion of the string of text following the indicator;

detecting first contact on a touch-screen of a computing device;

determining that the first contact corresponds to a first arc gesture the first contact extending along both a horizontal axis and a vertical axis from a first point to a second point, a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeding a horizontal threshold in a first direction relative to the first point, and a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the first contact exceeding a vertical threshold;

selecting the first secondary content that corresponds to the first arc gesture;

identifying supplemental text associated with the first secondary content; and

outputting second audio corresponding to the supplemental text in response to the first arc gesture.

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

outputting third audio including a second audio tone preceded by third synthesized speech and followed by fourth synthesized speech, the second audio tone associated with a second indicator of second secondary content located in a second string of text and based on a type of the second secondary content, the third synthesized speech associated with a portion of the second string of text prior to the second indicator and the fourth synthesized speech associated with a portion of the second string of text following the second indicator;

determining that a duration of time has elapsed without detecting the first arc gesture; and

outputting fourth audio associated with a third string of text following the second string of text.

6. The computer-implemented method of claim **4**, wherein

the identifying further comprises identifying a most recent secondary content item transmitted by a text-to-speech process.

7. The computer-implemented method of claim **4**, further comprising:

generating supplemental synthesized speech corresponding to the supplemental text, the supplemental synthesized speech having different voice parameters than at least one of the first synthesized speech and the second synthesized speech,

wherein the second audio includes the supplemental synthesized speech.

8. The computer-implemented method of claim **4**, wherein the method further comprises:

detecting second contact on the touch-screen;

determining that the second contact corresponds to a second arc gesture, the second contact extending along both a horizontal axis and a vertical axis from a third point to a fourth point, a difference between a third horizontal coordinate associated with the third point and a fourth horizontal coordinate associated with the fourth point exceeding a horizontal threshold, and a difference between a third vertical coordinate associated with the third point and a fourth vertical coordinate associated with a midpoint of the second input exceeding a vertical threshold.

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

identifying second secondary content in response to the horizontal difference between the third point and the fourth point being in a second direction relative to the third point; and

outputting third audio corresponding to the second secondary content in response to the second arc gesture.

10. The computer-implemented method of claim **8**, further comprising:

identifying third secondary content in response to the horizontal difference between the third point and the fourth point being in a third direction relative to the third point; and

outputting third audio corresponding to the third secondary content in response to the second arc gesture.

11. The computer-implemented method of claim **8**, further comprising:

outputting third audio including third synthesized speech associated with a portion of the string of text following the second synthesized speech.

12. The computer-implemented method of claim **5**, wherein the secondary content includes at least one of a footnote, an endnotes, a definition, a synonym, or a translation.

13. The computer-implemented method of claim **5**, further comprising:

determining a first direction between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point,

determining a second direction between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the coordinates; and

determining a configuration of the first arc gesture based on the first direction and the second direction.

14. The computer-implemented method of claim **5**, further comprising:

determining a predefined spiraling arc gesture based on coordinates of a second input, the coordinates extending in a circular manner from a first point through a second point to a third point near the first point and along both a horizontal axis and a vertical axis from the third point to a fourth point, a difference between a first horizontal coordinate associated with the third point and a second horizontal coordinate associated with the fourth point exceeding a horizontal threshold, and a difference between a first vertical coordinate associated with a vertical maximum of the second input and a second vertical coordinate associated with a vertical minimum of the second input exceeding a vertical threshold; and

navigating from a current content item to a different content item in response to detecting the spiraling arc gesture.

15. A computing device comprising:

one or more processors; and

a memory including instructions operable to be executed by the one or more processors to perform a set of actions to configure the device to:

output first audio including an audio tone preceded by first synthesized speech and followed by second synthesized speech, the audio tone associated with an indicator of first secondary content located in a string of text and based on a type of the first secondary content, the first synthesized speech associated with a portion of the string of text prior to the

indicator and the second synthesized speech associated with a portion of the string of text following the indicator;

detect first contact on a touch-screen of a computing device;

determine that the first contact corresponds to a first arc gesture, the first contact extending along both a horizontal axis and a vertical axis from a first point to a second point, a difference between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point exceeding a horizontal threshold in a first direction relative to the first point, and a difference between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the first contact exceeding a vertical threshold;

select the first secondary content that corresponds to the first arc gesture;

identify supplemental text associated with the first secondary content; and

output second audio corresponding to the supplemental text in response to the first arc gesture.

16. The computing device of claim **15**, wherein the instructions further configure the device to

identify a most recent secondary content item transmitted by a text-to-speech process.

17. The computing device of claim **15**, wherein the instructions further configure the device to:

generate supplemental synthesized speech corresponding to the supplemental text, the supplemental synthesized speech having different voice parameters than at least one of the first synthesized speech and the second synthesized speech,

wherein the second audio includes the supplemental synthesized speech.

18. The computing device of claim **15**, wherein the instructions further configure the system to:

detecting second contact on the touch-screen;

determine that the second contact corresponds to a second arc gesture, the second contact extending along both a horizontal axis and a vertical axis from a third point to a fourth point, a difference between a third horizontal coordinate associated with the third point and a fourth horizontal coordinate associated with the fourth point exceeding a horizontal threshold in a second direction relative to the third point, and a difference between a third vertical coordinate associated with the third point and a fourth vertical coordinate associated with a midpoint of the second input exceeding a vertical threshold.

19. The computing device of claim **18**, wherein the instructions further configure the device to:

identify second secondary content in response to the horizontal difference between the third point and the fourth point being in a second direction relative to the third point; and

output third audio corresponding to the second secondary content in response to the second arc gesture.

20. The computing device of claim **18**, wherein the instructions further configure the device to:

identify third secondary content in response to the horizontal difference between the third point and the fourth point being in a third direction relative to the third point; and

output third audio corresponding to the third secondary content in response to the second arc gesture.

21. The computing device of claim **15**, wherein the secondary content includes at least one of a footnote, an endnotes, a definition, a synonym, or a translation.

22. The computing device of claim **15**, wherein the instructions further configure the device to:

determine a first direction between a first horizontal coordinate associated with the first point and a second horizontal coordinate associated with the second point,

determine a second direction between a first vertical coordinate associated with the first point and a second vertical coordinate associated with a midpoint of the coordinates; and

determine a configuration of the first arc gesture based on the first direction and the second direction.

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