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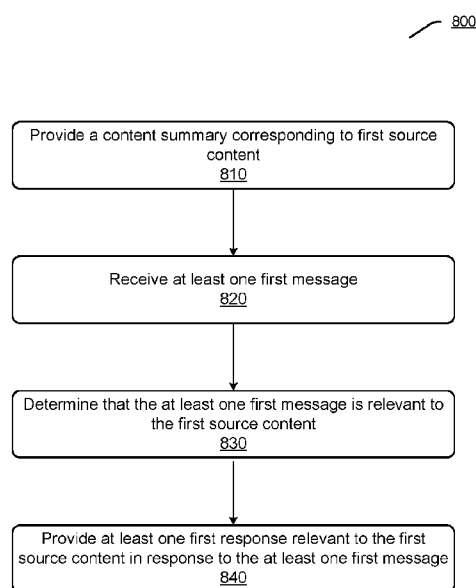


FIG 8

(57) Abstract: The present disclosure provides a method and apparatus for content recommendation in automated chatting. A content summary corresponding to first source content can be provided. At least one first message can be received. It is can be determined that the at least one first message is relevant to the first source content. In response to the at least one first message, at least one first response relevant to the first source content can be provided.

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CONTENT RECOMMENDATION IN AUTOMATED CHATTING

BACKGROUND

5 [0001] Chatbots are designed to simulate human conversations and provide automated chatting services to users via text, voice, images, and the like. Chatbots are being used in more and more scenarios. For example, a chatbot can recommend various content to a user in automated chatting, such as news, stories, academic articles, and the like.

SUMMARY

10 [0002] This Summary is provided to introduce a selection of concepts that are further described below in the Detailed Description. It is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

15 [0003] Embodiments of the present disclosure provide a method and apparatus for content recommendation in automated chatting. A content summary corresponding to first source content can be provided. At least one first message can be received. It is can be determined that the at least one first message is relevant to the first source content. In response to the at least one first message, at least one first response relevant to the first source content can be provided.

20 [0004] It should be noted that the above one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the drawings set forth in detail certain illustrative features of the one or more aspects. These features are only indicative of the various ways in which the principles of various aspects may be employed, and this disclosure is intended to include all such aspects and their equivalents.

25 BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The disclosed aspects will hereinafter be described in connection with the appended drawings that are provided to illustrate and not to limit the disclosed aspects.

[0006] FIG.1 illustrates an exemplary application scenario of a chatbot according to an embodiment of the present disclosure.

30 [0007] FIG.2 is a schematic diagram of exemplary stages of automated chatting according to an embodiment of the present disclosure.

[0008] FIG.3 illustrates an exemplary process for content recommendation in automated chatting according to an embodiment of the present disclosure.

[0009] FIG.4 illustrates an exemplary process for generating opposite standpoints

according to an embodiment of the present disclosure.

[0010] FIG.5 illustrates an exemplary chatting flow for content recommendation in automated chatting according to an embodiment of the present disclosure.

5 [0011] FIG.6 illustrates an exemplary process for another content recommendation in automated chatting according to an embodiment of the present disclosure.

[0012] FIG.7 illustrates an exemplary chatting flow for another content recommendation in automated chatting according to an embodiment of the present disclosure.

10 [0013] FIG.8 is a flowchart of an exemplary method for content recommendation in automated chatting according to an embodiment of the present disclosure.

[0014] FIG.9 illustrates an exemplary apparatus for content recommendation in automated chatting according to an embodiment of the present disclosure.

[0015] FIG.10 illustrates an exemplary apparatus for content recommendation in automated chatting according to an embodiment of the present disclosure.

15 DETAILED DESCRIPTION

[0016] The present disclosure will now be discussed with reference to several example implementations. It is to be understood that these implementations are discussed only for enabling those skilled in the art to better understand and thus implement the embodiments of the present disclosure, rather than suggesting any limitations on the scope of the present disclosure.

20 [0017] Existing chatbots can provide users with summaries and/or pictures corresponding to various content such as news, stories, academic articles, etc., in automated chatting, and provide preset options to interact with the users. These preset options include, for example, an option to provide an additional summary of the recommended content when clicked, such as an option named "Learn More", and an option to provide a summary and/or picture corresponding to other content when clicked, such as an option named "Next". For example, in the scenario of recommending news to a user in automated chatting, firstly, a summary corresponding to recommended news may be presented in a chatting flow of the chatbot and the user. The option "Learn More" and the option "Next" can then be presented

25 in the chatting flow. The user can click the option "Learn More" to obtain an additional summary corresponding to the news. Alternatively, the user can also click the option "Next Item" to obtain a summary and/or picture corresponding to other news. In this chatting mode, the user can only obtain the summary and/or picture corresponding to the recommended content, and the user can only interact with the chatbot according to default options provided

30

by it, and cannot respond spontaneously, and thus is restricted in terms of obtaining information.

[0018] Embodiments of the present disclosure propose to provide content recommendation in automated chatting in conjunction with artificial intelligence technology.

5 According to the embodiments of the present disclosure, the chatbot may provide the user with richer information about the recommended source content. Herein, source content refers to original files of content that the chatbot recommends to the user, such as news, a story, or an academic article. Moreover, the user can enter various messages in a dialog box for chatting with the chatbot to interact with the chatbot without being limited to clicking
10 the preset options provided by the chatbot.

[0019] In one aspect, the embodiments of the present disclosure may provide various information corresponding to the source content after determining the source content to be recommended to the user, such as inducements, content summaries, pictures, opposite standpoints, etc., corresponding to the source content. Herein, an inducement refers to a
15 statement used to induce a user to read source content to be recommended. For example, An inducement corresponding to an article introducing running can be "*Do you like running?*". Moreover, herein, opposite standpoints refer to two opposing standpoints for specific source content. Continuing with the example of the article introducing running, there may be the following opposite standpoints: "*Some people think that running is a convenient and*
20 *effective way to exercise, while some people think that running will hurt the knee and should not be promoted.*"

[0020] In another aspect, the embodiments of the present disclosure can make multiple rounds of content chatting with a user based on the recommended source content. In this context, content chatting refers to chatting under a particular source content topic, i.e., for a
25 user message, providing a response relevant to that particular content. In one embodiment, a received user message may be detected throughout a automated chatting process to determine whether the user is still chatting in the current source content topic. If so, the user is replied with the response associated with the current source content to keep chatting under the current source content topic.

30 **[0021]** In yet another aspect, the embodiments of the present disclosure may perform general chatting with the user by providing a response irrelevant to the recommended source content, and may detect a number of rounds of the general chatting and the amount of information of user messages. In this context, general chatting refers to chatting that is not directed to any particular source content, which may also be referred to as chit chatting.

Another content recommendation may be provided when it is detected that the number of rounds of the general chatting exceeds a threshold, or a continuous predetermined number of user messages have low information, that is, when the general chatting approaches convergence.

5 **[0022]** Since the embodiments of the present disclosure can provide various information corresponding to the recommended source content, the user can be enabled to obtain richer information relevant to the recommended source content. Moreover, since the embodiments of the present disclosure can perform multiple rounds of communication with the user based on the recommended source content, the user can be enabled to think more deeply about the
10 recommended source content and a deeper discussion can be triggered. Moreover, since the embodiments of the present disclosure can recommend another source content when the general chatting approaches convergence, the user can also be enabled to obtain more resource information during the chatting process.

[0023] It should be appreciated that although the foregoing discussion and the following
15 discussion relate to examples of recommending news or articles in automated chatting, the embodiments of the present disclosure are not limited thereto, but any other type of source content can be recommended in automated chatting in a similar manner.

[0024] FIG.1 illustrates an exemplary application scenario 100 of a chatbot according to an embodiment of the present disclosure. In the scenario 100, a network 110 is applied to
20 interconnect between a terminal device 120, a chatbot server 130, and a content source 140. The network 110 may be any type of network capable of interconnecting network entities. The network 110 can be a single network or a combination of various types of networks. In terms of coverage, the network 110 can be a Local Area Network (LAN), a Wide Area Network (WAN), and the like. In terms of bearer medium, the network 110 can be a wired
25 network, a wireless network, and the like. In terms of data exchange technology, the network 110 can be a circuit switched network, a packet switched network, and the like.

[0025] The terminal device 120 can be any type of electronic computing device capable of connecting to the network 110, accessing a server or website on the network 110, processing data or signals, and the like. For example, the terminal device 120 can be a
30 desktop computer, a notebook computer, a tablet computer, a smart phone, and the like. Although only one terminal device 120 is shown in FIG. 1, it should be appreciated that a different number of terminal devices may be connected to the network 110.

[0026] The terminal device 120 can include a chatbot client 122 that can provide an automated chatting service to a user. In some implementations, the chatbot client 122 can

interact with the chatbot server 130 and present the user with information and responses that the chatbot server 130 provides. For example, the chatbot client 122 can send a message input by the user to the chatbot server 130 and receive a response relevant to the message from the chatbot server 130. However, it should be appreciated that in other embodiments, the chatbot client 122 may also generate a response to the user-input message locally, rather than interacting with the chatbot server 130.

[0027] The chatbot server 130 may collect the source content from the content source 140 and determine the source content recommended to the user of the terminal device 120. The content source 140 may refer to a source that can provide various content to the public, such as a website that provides news, a database that stores academic articles, and the like. The chatbot server 130 can also provide the user of the terminal device 120 with various information corresponding to the determined source content, such as inducements, content summaries, pictures, and opposite standpoints, and the like. Moreover, the chatbot server 130 may also perform, with the user of the terminal device 120, content chatting relevant to the recommended source content and general chatting irrelevant to the recommended source content. Various information corresponding to the source content and corpus for the content chatting and the general chatting may be stored in the chatbot database 132 which the chatbot server 130 is connected to or included in.

[0028] It should be appreciated that all of the network entities shown in FIG. 1 are exemplary, and any other network entity may be involved in the application scenario 100 according to specific application requirements.

[0029] FIG.2 is a schematic diagram 200 of exemplary stages of automated chatting according to an embodiment of the present disclosure. Generally, the automated chatting according to an embodiment of the present disclosure may comprise three stages: an information providing stage 210 for providing, to a user, information corresponding to source content; an content chatting stage 220 for conducting a content chatting relevant to the source content with the user; and a general chatting stage 230 for conducting general chatting irrelevant to the source content with the user. The automated chatting process can be transferred between these three stages 210-230 if corresponding predetermined rules are met. Specific details of the transition between these three stages 210-230 will be specifically explained below in conjunction with FIG.3.

[0030] FIG.3 illustrates an exemplary process 300 for content recommendation in automated chatting according to an embodiment of the present disclosure. In some embodiments, the process 300 may be performed by the chatbot server 130 and/or the

chatbot client 122 shown in FIG.1.

[0031] At 302, source content to be recommended can be determined. In one implementation, a plurality of source content may firstly be obtained via the network. For example, a plurality of news can be obtained from a news website. The plurality of source content obtained can then be ranked based on a variety of factors. In one embodiment, the source content can be ranked based on timeliness of the source content. For example, the latest news can be ranked at the forefront. In another embodiment, the source content can be ranked based on popularity of the source content. For example, a number of comments for each news can be counted and the news with the most comments can be ranked at the forefront. In yet another embodiment, the ranking can be based on relevance between the source content and a user profile. For example, if the user profile indicates that the user is interested in football, then football-related news can be ranked at the forefront. In still another embodiment, the source content can be ranked based on relevance between the source content and a received message. For example, if the user enters a message about a movie star in a chat dialog, the news related to the movie star can be ranked at the forefront. After ranking the plurality of source content obtained, the source content to be recommended may be selected from the plurality of source content based on the ranking. For example, the highest-ranked source content can be selected as the source content to be recommended.

[0032] At 304, an inducement corresponding to the determined source content can be provided. In an implementation, the inducement corresponding to the source content can be manually written based on the source content. In another implementation, the inducement corresponding to the source content can be automatically generated based on the source content. For example, a sequence-to-sequence (Seq2Seq) model that introduces an Attention mechanism can be used to automatically generate the inducement. The model can have an encoder-decoder structure. According to the model, at least a portion of the source content, such as the title or body of the source content, can be provided to the encoder for encoding and then decoded by the decoder to obtain an inducement corresponding to the source content.

[0033] At 306, a message from the user can be received.

[0034] At 308, it can be determined whether the received message is relevant to the inducement. In one embodiment, whether the message is relevant to the inducement can be determined based on whether the message includes an expression relevant to the inducement. If the message includes the expression relevant to the inducement, the message can be

considered to be relevant to the inducement. For example, if the inducement includes an expression "*tornado*" and the user message also mentions "*tornado*", the user message can be considered to be relevant to the inducement. In another embodiment, whether the message is relevant to the inducement can be determined based on whether the message includes a predetermined word. If the message includes a predetermined word indicating affirmation, approval, or suspicion, such as "*good*", "*yes*", "*right*", "*really*", etc., the message can be considered to be relevant to the inducement.

[0035] At 310, in response to determining that the message is irrelevant to the inducement, the process 300 transfers to general chatting 310 irrelevant to the source content. For example, the general chatting with the user can be made by providing a response to the message that is irrelevant to the source content. In an implementation, the response that is irrelevant to the source content can be generated by a general response model. The general response model is trained in a general domain.

[0036] At 312, in response to determining that the message is relevant to the inducement, other information corresponding to the source content can be optionally provided. The information may include, for example, a summary 314, an additional summary 316, a picture 318, and opposite standpoints 320 corresponding to the source content. In one implementation, the summary 314 and the additional summary 316 may be generated simultaneously using a contextual relationship-based summary (CRSums) model. The model uses a two-level attention mechanism for words and sentences. A sentence representation can be constructed firstly using a sentence and a convolutional neural network with a word-level attention mechanism, then a context representation can be constructed using contextual relationship and a recursive neural network with a sentence-level attention mechanism, and useful context features can be finally automatically learned by learning together the representation of sentence and the similarity score between sentences in the context of sentence. The CRSums model can score sentences in the input text and select one or more highest-scored sentences. The picture 316 can be provided by a service provider that provides the source content, such as a news website. Alternatively, the picture 316 may also be extracted from the source content body. The opposite standpoints 320 are generated based on comments of the source content. In an implementation, a transformer-based sentence classification model can be employed to generate opposite standpoints. The input to the model is complete comments, and the output is a label of the model's predicted standpoints. Details of generating opposite standpoints will be explained later in conjunction with FIG.4.

[0037] According to the embodiments of the present disclosure, the other information corresponding to the source content is sequentially provided, and after one or more items of information are provided, whether to continue to provide further additional information can be determined based on whether the received next message is relevant to the source content.

5 For example, the summary 314 and the picture 318 corresponding to the source content may be provided firstly. If it is determined that the received message for the summary 314 and the picture 318 is relevant to the source content, then the additional summary 316 corresponding to the source content may continue to be provided. By that analogy, if it is determined that the received message for the additional summary 316 is relevant to the
10 source content, then the opposite standpoints 320 corresponding to the source content may continue to be provided.

[0038] It should be appreciated that although the information corresponding to the source content in the process 300 includes an inducement, a summary, an additional summary, a picture, opposite standpoints, etc., the embodiments of the present disclosure
15 are not limited thereto, and the information corresponding to the source content can also include more or less information. Moreover, although the inducement is firstly provided in the process 300, the embodiments of the present disclosure are not limited thereto, and other information corresponding to the source content, such as a summary, etc., may be directly provided without providing an inducement.

20 [0039] After other information corresponding to the source content is provided, a message can continue to be received from the user at 322.

At 324, it can be determined whether the message received at 322 is relevant to the source content. In an embodiment, if the message includes an expression relevant to the source content, the message can be considered to be relevant to the source content. For
25 example, if the source content is an article that describes running, and the user message mentions running, the user message can be considered relevant to the source content. In another embodiment, if the message is relevant to a previous message that is immediately before the message, the message can be considered to be relevant to the source content. For example, if two consecutive messages relate to the same topic, the latter of the two messages
30 can be considered to be relevant to the source content. In yet another embodiment, if the message is relevant to a response to a previous message that is immediately before the message, the message can be considered to be relevant to the source content. For example, given the source content being a piece of news introducing train speedup, if a first user message is "*What is the maximum speed of a new high-speed train now?*", a response of the

chatbot to the first user message is *"about 400 kilometers per hour, 30% faster than the previous high-speed train"*, and the second user message is *"really much faster"*, the second user message can be considered to be relevant to the source content because it is relevant to the response to the first user message. In still another embodiment, if the message includes a predetermined word indicating affirmation, approval, or suspicion, such as *"good"*, *"yes"*, *"right"*, *"really"*, etc., the message can be considered to be relevant to the source content. Among the various ways of determining whether the message is relevant to the source content, the approach based on the predetermined word may have the highest priority.

[0040] If it is determined at 324 that the received message is irrelevant to the source content, the process 300 can transfer to the general chatting at 310, providing a response that is irrelevant to the source content.

[0041] If it is determined at 324 that the received message is relevant to the source content, it may be determined at 326 whether a transfer to the general chatting is required, for example, whether the message satisfies at least one of a set of predetermined rules for transferring to the general chatting. In an implementation, the set of predetermined rules may include rules for a number of rounds of dialog relevant to the source content. For example, it may be determined whether the number of responses relevant to the source content that the chatting server has provided before the message satisfies a predetermined threshold. The predetermined threshold can be set to, for example, *"10"*. In this case, if 10 responses relevant to the source content have been provided before the message, that is, 10 rounds of dialog have been made, the message satisfies the rule based on the number of rounds of dialog. In another implementation, the set of predetermined rules may include a rule based on chatting convergence. For example, it may be determined whether the message and a predetermined number of previous messages immediately before to the message have low information. Herein, a message having low information means that the message does not have a clear semantic meaning. For example, if the message is an interjection such as *"hmm," "oh," "ha-ha,"* the message can be considered to have low information. The predetermined number can be set, for example, to *"1"*. In this case, if this message and the previous message, that is, two consecutive messages, have low information, this message satisfies the rule based on chatting convergence. In response to determining that this message satisfies at least one of the set of predetermined rules for transferring to the general chatting, the process 300 transfers to the general chatting at 310.

[0042] If it is determined at 326 that the message received at 322 does not satisfy any of the set of predetermined rules for transferring to the general chatting, a response relevant

to the source content may be provided at 328 to conduct content chatting relevant to the source content. In an implementation, a response can be provided based on a retrieve approach. The response relevant to the source content may be provided by retrieving a plurality of comments corresponding to the source content and selecting at least one of the plurality of retrieved comments. For example, a comment that matches the message received at 322 can be selected from the plurality of retrieved comments as a response. A transformer-based text matching model can be employed to provide a response based on the retrieval approach. In another implementation, a response can be provided based on a generation approach. The response relevant to the source content may be provided by providing a response generated by a domain-specific response model for the message received at 322. The domain-specific response model can employ a sequence-to-sequence model that introduces an attention mechanism. The domain-specific response model can be trained within a domain corresponding to the source content. For example, the domain-specific response model can be trained using training data in the form <source content, user message, response>. It should be appreciated that multiple rounds of content chatting can be performed. For example, after the response relevant to the source content is provided at 328, the process 300 can iteratively return to step 322 to continue to receive the message and, in turn, provide a response relevant to the source content and corresponding to the message, until the received message is irrelevant to the source content or satisfies the predetermined rules at step 326.

[0043] With reference to FIG.3, the process 300 includes: an information providing stage for providing, to a user, information corresponding to source content, such as the steps 304-312; an content chatting stage for conducting a content chatting relevant to the source content with the user, such as the steps 322-328; and a general chatting stage for conducting general chatting irrelevant to the source content with the user, such as the step 310. In the information providing stage, in response to determining that the received message is irrelevant to the provided information corresponding to the source content, the process 300 can transfer to the general chatting stage. After providing the user with various information corresponding to the source content, the process 300 can transfer to the content chatting stage. Further, in the content chatting stage, in response to determining that the received message is irrelevant to the source content or satisfying at least one of a set of predetermined rules for transferring to the general chatting, the process 300 can transfer to the general chatting stage.

[0044] It should be appreciated that although only the transferring from the information

providing stage to the content chatting stage and the general chatting stage, and the transferring from the content chatting stage to the general chatting stage are shown in FIG. 3, the embodiments of the present disclosure are not limited thereto, for example, in the general chatting stage, if a message relevant to the source content is received, the process
5 300 can transfer to the information providing stage or the content chatting stage.

[0045] FIG.4 illustrates an exemplary process 400 for generating opposite standpoints according to an embodiment of the present disclosure. In some embodiments, the generated opposite standpoints may be stored in the chatbot database 132 shown in FIG.1.

[0046] At 410, a plurality of comments corresponding to recommended source content
10 can be retrieved. For example, for a piece of news about the train speedup, a plurality of comments corresponding to the news can be retrieved from a website that reports the news. The retrieved comments can be, for example, "*Great! We can get home soon!*", "*Capacity increases, and the difficulty of getting tickets for the holidays can be alleviated.*", "*So fast, will it be unsafe?*", "*The ticket price must increase because of the speedup !*" etc.

[0047] At 420, the plurality of retrieved comments can be classified into a set of positive comments 430 and a set of negative comments 432. For example, the above-mentioned comments "*Great! We can get home soon!*", and "*Capacity increases, and the difficulty of getting tickets for the holidays can be alleviated.*" can be classified as the positive comments, while the comments "*So fast, will it be unsafe?*", "*The ticket price must increase because of the speedup !*" can be classified as the negative comments.
20

[0048] Then, a representative positive comment 440 can be selected from the set of positive comments 430 and a representative negative comment 442 can be selected from the set of negative comments 432. For example, "*Great! We can get home soon!*" can be selected as the representative positive comment, and "*So fast, will it be unsafe?*" can be selected as the representative negative comment. The above selection of representative comments may be based on, for example, the number of forwards, the degree of attention of the comments, and the like.
25

[0049] At 450, the representative positive comment 440 can be optionally rephrased to obtain a rephrased representative positive comment 460. For example, the representative positive comment "*Great! We can get home soon!*" can be rephrased to obtain a rephrased representative positive comment "*Train speedup can shorten the itinerary*".
30

[0050] At 452, the representative negative comment 442 can be optionally rephrased to obtain a rephrased representative negative comment 462. For example, the representative negative comment "*So fast, will it be unsafe?*" can be rephrased to obtain a rephrased

representative negative comment "*Train speedup may cause safety risks*".

[0051] The rephrasing at 450 and 452 can be implemented by using a variety of natural language models that can be trained to rephrase input statements from one expression to another while maintaining semantic relevance.

5 [0052] At 470, opposite standpoints can be generated based on the rephrased representative positive comment 460 and the rephrased representative negative comment 462. For example, opposite standpoints, such as "*Some people think that train speedup can shorten the itinerary, while some people think that train speedup may cause safety risks*", can be generated based on the rephrased representative positive comment "*Train speedup*
10 *can shorten the itinerary*" and the rephrased representative negative comment "*Train speedup may cause safety risks*".

[0053] FIG.5 illustrates an exemplary chatting flow 500 for content recommendation in automated chatting according to an embodiment of the present disclosure. The chatting flow 500 can occur between the chatbot server 130 and the user of the terminal device 120 shown
15 in FIG. 1, that is, between the chatbot and the user shown in FIG. 5.

[0054] The chatbot can firstly determine source content to recommend. For example, the chatbot can determine to recommend a piece of news about a tornado.

[0055] At 502, the chatbot can provide an inducement that corresponds to the piece of news, such as "*Have you ever experienced a tornado?*".

20 [0056] At 504, the user can enter a message "*I have not experienced it.*"

[0057] The chatbot can detect the message at 504 to determine whether it is relevant to the piece of news. Here, it is can be determined that the message "*I have not experienced it.*" is relevant to the inducement "*Have you ever experienced a tornado?*" provided by the chatbot.

25 [0058] At 506, in response to determining that the message at 504 is relevant to the inducement, the chatbot may provide a first summary corresponding to the piece of news "*At about 15 o'clock on the afternoon of March 31, Park A was hit by a tornado, which caused a trampoline on the scene blown away, several children were taken to the sky then fell down.*", and a picture taken from the body of the news.

30 [0059] At 508, the user can enter a message "*Really?*"

[0060] The chatbot can detect the message at 508 to determine whether it is relevant to the news. Since the message "*Really?*" includes the predetermined word "*Really*", it can be determined that the message is relevant to this news.

[0061] At 510, in response to determining that the message at 508 is relevant to the news,

the chatbot can continue to provide information corresponding to the news, such as the second summary *"As of now, the tornado has caused two children to die and 20 injured. One child with severe injuries has been successfully performed surgery, and other 19 are stable."*

5 **[0062]** At 512, the user can enter a message *"It's quite serious."*

[0063] The chatbot can detect the message at 512 to determine whether it is relevant to the news. Since the message is relevant to the response to the previous message immediately before the message, i.e. the message at 512 is relevant to the second summary at 510, it can be determined that the message is relevant to this news.

10 **[0064]** At 514, in response to determining that the message at 512 is relevant to the news, the chatbot may continue to provide information corresponding to the news, such as opposite standpoints *"Some netizens think that scenic spots should enhance disaster prevention, while some think that it is difficult to evade natural disasters."*

15 **[0065]** At 516, the user can comment on the opposite standpoints provided by the chatbot at 514, such as entering a message *"Well, scenic spots should enhance disaster prevention."*

[0066] The chatbot can determine that the message is relevant to this news by determining that the message at 516 is relevant to the opposite standpoints at 514. Moreover, the chatbot can also determine that the message at 516 does not satisfy any of a set of
20 predetermined rules for transferring to the general chatting. The set of predetermined rules includes, for example, the rules described with reference to the step 326 in FIG.3.

[0067] At 518, in response to determining that the message at 516 is relevant to the news, and the message does not satisfy any of a set of predetermined rules for transferring to the general chatting, the chatbot can conduct, with the user, content chatting relevant to the
25 news, such as providing a response relevant to the news *"Yes. The trampoline should have a fixture."* The response may be provided, for example, based on the retrieval approach or the generation approach as described with reference to the step 328 in FIG.3.

[0068] At 520, the user can enter a message, such as *"What is the weather like in Beijing today?"*

30 **[0069]** The chatbot can determine that the message at 520 is irrelevant to this news. For example, the chatbot can make this determination in a manner that determines whether a message is relevant to a source content, as described with reference to the step 324 shown in FIG.3.

[0070] At 522, in response to determining that the message at 520 is irrelevant to the

news, the chatbot can jump out of the content chatting relevant to the news and enter general chatting. For example, the chatbot can provide the user with a response to the message that is irrelevant to the news, such as "*Clear, 14 degrees to 29 degrees, north wind level 4.*"

[0071] At 524, the user can enter a message, such as "*Hmm*".

5 [0072] At 526, the chatbot can continue to conduct the general chatting with the user, for example, to provide "*Summer is coming soon.*"

[0073] At 528, the user can enter a message, such as "*Oh*".

[0074] As shown in FIG.5, the message "*Hmm*" at 524 and the message "*Oh*" at 528 have low information. That is, two consecutive user messages have low information, which
10 indicates that the general chatting approaches convergence. In this case, the chatbot can recommend another content to the user.

[0075] FIG.6 illustrates an exemplary process 600 for another content recommendation in automated chatting according to an embodiment of the present disclosure. In some embodiments, the process 600 may be performed by the chatbot server 130 and/or the
15 chatbot client 122 shown in FIG.1.

[0076] At 610, a message from a user can be received.

[0077] At 620, it can be determined whether the received message is relevant to a currently recommended source content. For example, this determination can be made in a manner that determines whether a message is relevant to a source content, as described with
20 reference to the step 324 shown in FIG.3.

[0078] In response to determining that the received message is relevant to the currently recommended source content, a response relevant to the source content can be provided at 630. For example, various information corresponding to the source content may be provided in a manner described with reference to FIG. 3, such as a summary, a picture, opposite
25 standpoints, etc. corresponding to the source content, or a response relevant to the source content for content chatting.

[0079] In response to determining that the received message is irrelevant to the currently recommended source content, it may be determined at 640 whether the message satisfies at least one of a set of predetermined rules for providing another source content recommendation. In an implementation, the set of predetermined rules may include rules
30 based on a number of rounds of dialog relevant to the source content. For example, it may be determined whether a number of responses relevant to the source content that the chatting server has provided before the message satisfies a predetermined threshold. The predetermined threshold can be set to, for example, "10". In this case, if 10 responses

relevant to the source content have been provided by the chatting server before the message, that is, 10 rounds of dialog relevant to the source content have been made, the message satisfies the rule based on the number of rounds of dialog. In another implementation, the set of predetermined rules may include a rule based on chatting convergence. For example, it may be determined whether the message and a predetermined number of previous messages immediately before to the message have low information. The predetermined number can be set, for example, to "1". In this case, if this message and the previous message, that is, two consecutive messages, have low information, this message satisfies the rule based on chatting convergence.

[0080] In response to determining that the received message does not satisfy any of the set of predetermined rules that provide another source content recommendation, a general chatting with the user may be made at 650 by providing a response irrelevant to the currently recommended source content. The response can be, for example, a response to the message generated by a general response model.

[0081] In response to determining that the received message satisfies at least one of the set of predetermined rules that provide another source content recommendation, information corresponding to another source content, such as an inducement, a summary, a picture, opposite standpoints, etc. corresponding to another source content, may be provided at 660.

[0082] As shown in FIG. 6, in response to determining that the received message is irrelevant to the currently recommended source content, the process 600 may firstly transfer to the general chatting stage. In the event that the received message satisfies at least one of a set of predetermined rules for providing another source content recommendation, the process 600 may transfer to a stage for another content recommendation.

[0083] FIG.7 illustrates an exemplary chatting flow 700 for another content recommendation in automated chatting according to an embodiment of the present disclosure. The chatting flow 700 can occur between the chatbot server 130 and the user of the terminal device 120 shown in FIG. 1, that is, between the chatbot and the user shown in FIG. 5. Moreover, the chatting flow 700 can be a further extension of the chatting flow 500 shown in FIG.5. For example, messages 702-710 shown in FIG. 7 may correspond to the messages 520-528 shown in FIG. 5, respectively.

[0084] As shown in FIG. 7, user messages "hmm" and "oh" are received at 706 and 710, respectively. Both messages have low information. That is, two user messages with low information are consecutively received. Therefore, it can be determined that the general chatting with the user has converged.

[0085] At 712, in response to determining that the general chatting with the user has converged, another content recommendation can be provided. For example, a chatbot can provide recommendations for another news about foreign objects found during infusion. The chatbot can provide an inducement corresponding to the news, such as "*Well, have you*
5 *heard of foreign objects found in infusion at hospital?*" Moreover, before providing the inducement, the chatbot can also respond to the message at 710, such as "*Don't be so perfunctory,*" to make the chatting more smooth and natural.

[0086] At 714, the user can enter a message "*Never heard of this.*"

[0087] The chatbot can determine to continue the recommendation about this another
10 news by determining that the message at 714 is relevant to the inducement at 712.

[0088] In response to determining that the message at 714 is relevant to the inducement at 712, the chatbot may continue to provide information corresponding to this another news at 716, for example, a summary "*Recently, Hospital S was complained, and the reporter, Ms. Sun, said that she found a hair about 2 cm long in the dropper when she was having an*
15 *infusion at the hospital.*"

[0089] FIG.8 is a flowchart of an exemplary method 800 for content recommendation in automated chatting according to an embodiment of the present disclosure.

[0090] At step 810, a content summary corresponding to first source content can be provided.

20 [0091] At step 820, at least one first message can be received.

[0092] At step 830, it is can be determined that the at least one first message is relevant to the first source content.

[0093] At step 840, at least one first response relevant to the first source content can be provided in response to the at least one first message.

25 [0094] In an implementation, the providing the content summary comprises: providing an inducement corresponding to the first source content; receiving a message for the inducement; determining that the message is relevant to the inducement; and providing the content summary corresponding to the first source content.

[0095] In an implementation, the method 800 further comprises: determining the first
30 source content by: obtaining a plurality of source content; ranking the plurality of source content based on at least one of: timeliness of source content, popularity of source content, relevance between source content and a user profile, and relevance between source content and a received message; and selecting the first source content from the plurality of source content based on the ranking.

[0096] In an implementation, the determining comprises determining, for each first message of the at least one first message, at least one of: the first message including an expression relevant to the first source content; the first message being relevant to a previous message immediately before the first message; the first message being relevant to a response to the previous message; and the first message including a predetermined word.

[0097] In an implementation, the providing the at least one first response comprises: providing opposite standpoints corresponding to the first source content.

[0098] In an implementation, the method 800 further comprises: retrieving a plurality of comments corresponding to the first source content; classifying the plurality of comments as a set of positive comments and a set of negative comments; selecting a representative positive comment from the set of positive comments; selecting a representative negative comment from the set of negative comments; and generating the opposite standpoints based on the representative positive comment and the representative negative comment.

[0099] In an implementation, the generating the opposite standpoints comprises: rephrasing the representative positive comment and the representative negative comment, respectively; and generating the opposite standpoints based on the rephrased representative positive comment and the rephrased representative negative comment.

[00100] In an implementation, the providing the at least one first response comprises: retrieving a plurality of comments corresponding to the first source content; and providing at least one comment selected from the plurality of comments.

[00101] In an implementation, the providing the at least one first response comprises: providing a response to the at least one first message generated by a domain-specific response model, the domain-specific response model being trained within a domain corresponding to the first source content.

[00102] In an implementation, the providing the at least one first response comprises: providing a picture or additional content summary corresponding to the first source content.

[00103] In an implementation, the method 800 further comprises, for a first message of the at least one first message: determining that at least one of a first set of predetermined rules is satisfied, the first set of predetermined rules comprising: a number of the at least one first response that has been provided prior to the first message satisfying a first predetermined threshold, and the first message and a predetermined number of previous messages immediately before the first message have low information; and providing a response to the first message generated by a general response model.

[00104] In an implementation, the method 800 further comprises, receiving at least one

second message; and determining that the at least one second message is irrelevant to the first source content; and in response to the at least one second message, providing at least one second response.

5 [00105] In an implementation, the providing the at least one second response comprises: providing an inducement or content summary corresponding to second source content.

[00106] In an implementation, the providing the at least one second response comprises, for a second message of the at least one second message: determining that at least one of a second set of predetermined rules is satisfied, the second set of predetermined rules comprising: a number of the at least one second response that has been provided prior to the
10 second message satisfying a second predetermined threshold, and the second message and a predetermined number of previous messages immediately before the second message have low information; and providing an inducement or content summary corresponding to second source content.

[00107] In an implementation, the providing the at least one second response comprises:
15 providing a response to the at least one second message generated by a general response model.

[00108] It should be appreciated that the method 800 may further comprise any steps/processes for content recommendation in automated chatting according to the embodiments of the present disclosure as mentioned above.

20 [00109] FIG.9 illustrates an exemplary apparatus 900 for content recommendation in automated chatting according to an embodiment of the present disclosure. The apparatus 900 may comprise a summary providing module 910, for providing a content summary corresponding to first source content; a receiving module 920, for receiving at least one first message; a determining module 930, for determining that the at least one first message is
25 relevant to the first source content; and a response providing module 940, for providing at least one first response relevant to the first source content in response to the at least one first message.

[00110] In an implementation, the determining module is further configured for determining, for each first message of the at least one first message, at least one of: the first
30 message including an expression relevant to the first source content; the first message being relevant to a previous message immediately before the first message; the first message being relevant to a response to the previous message; and the first message including a predetermined word.

[00111] In an implementation, the response providing module is further configured for:

providing opposite standpoints corresponding to the first source content.

[00112] In an implementation, the response providing module is further configured for, for a first message of the at least one first message: determining that at least one of a first set of predetermined rules is satisfied, the first set of predetermined rules comprising: a number of the at least one first response that has been provided prior to the first message satisfying a first predetermined threshold; and the first message and a predetermined number of previous messages immediately before the first message have low information; and providing a response to the first message generated by a general response model.

[00113] Moreover, the apparatus 900 may further comprise any other modules configured for content recommendation in automated chatting according to the embodiments of the present disclosure as mentioned above.

[00114] FIG.10 illustrates an exemplary apparatus 1000 for content recommendation in automated chatting according to an embodiment of the present disclosure.

[00115] The apparatus 1000 may comprise at least one processor 1010. The apparatus 1000 may further comprise a memory 1020 coupled with processor 1010. The memory 1020 may store computer-executable instructions that, when executed, cause processor 1010 to perform any operations of the methods for content recommendation in automated chatting according to the embodiments of the present disclosure as mentioned above.

[00116] The embodiments of the present disclosure may be embodied in a non-transitory computer-readable medium. The non-transitory computer-readable medium may comprise instructions that, when executed, cause one or more processors to perform any operations of the methods for content recommendation in automated chatting according to the embodiments of the present disclosure as mentioned above.

[00117] It should be appreciated that all the operations in the methods described above are merely exemplary, and the present disclosure is not limited to any operations in the methods or sequence orders of these operations, and should cover all other equivalents under the same or similar concepts.

[00118] It should also be appreciated that all the modules in the apparatuses described above may be implemented in various approaches. These modules may be implemented as hardware, software, or a combination thereof. Moreover, any of these modules may be further functionally divided into sub-modules or combined together.

[00119] Processors are described in connection with various apparatus and methods. These processors can be implemented using electronic hardware, computer software, or any combination thereof. Whether these processors are implemented as hardware or software

will depend on the specific application and the overall design constraints imposed on the system. By way of example, a processor, any portion of a processor, or any combination of processors presented in this disclosure may be implemented as a microprocessor, a microcontroller, a digital signal processor (DSP), a field programmable gate array (FPGA), a programmable logic device (PLD), state machine, gate logic, discrete hardware circuitry, and other suitable processing components configured to perform the various functions described in this disclosure. The functions of a processor, any portion of a processor, or any combination of processors presented in this disclosure may be implemented as software executed by a microprocessor, a microcontroller, a DSP, or other suitable platforms.

[00120] Software should be considered broadly to represent instructions, instruction sets, code, code segments, program code, programs, subroutines, software modules, applications, software applications, software packages, routines, subroutines, objects, running threads, processes, functions, and the like. Software can reside on computer readable medium. Computer readable medium may include, for example, a memory, which may be, for example, a magnetic storage device (e.g., a hard disk, a floppy disk, a magnetic strip), an optical disk, a smart card, a flash memory device, a random access memory (RAM), a read only memory (ROM), a programmable ROM (PROM), an erasable PROM (EPROM), an electrically erasable PROM (EEPROM), a register, or a removable disk. Although a memory is shown as being separate from the processor in various aspects presented in this disclosure, a memory may also be internal to the processor (e.g., a cache or a register).

[00121] The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein. All structural and functional equivalents to the elements of the various aspects described throughout the present disclosure that are known or later come to be known to those of ordinary skilled in the art are intended to be encompassed by the claims.

CLAIMS

1. A method for content recommendation in automated chatting, comprising:
providing a content summary corresponding to first source content;
receiving at least one first message;
determining that the at least one first message is relevant to the first source content;
and
providing at least one first response relevant to the first source content in response to the at least one first message.
2. The method of claim 1, wherein the providing the content summary comprises:
providing an inducement corresponding to the first source content;
receiving a message for the inducement;
determining that the message is relevant to the inducement; and
providing the content summary corresponding to the first source content.
3. The method of claim 1, further comprising determining the first source content by:
obtaining a plurality of source content;
ranking the plurality of source content based on at least one of: timeliness of source content, popularity of source content, relevance between source content and a user profile, and relevance between source content and a received message; and
selecting the first source content from the plurality of source content based on the ranking.
4. The method of claim 1, wherein the determining comprises determining, for each first message of the at least one first message, at least one of:
the first message including an expression relevant to the first source content;
the first message being relevant to a previous message immediately before the first message;
the first message being relevant to a response to the previous message; and
the first message including a predetermined word.
5. The method of claim 1, wherein the providing the at least one first response comprises:
providing opposite standpoints corresponding to the first source content.
6. The method of claim 5, further comprising:
retrieving a plurality of comments corresponding to the first source content;
classifying the plurality of comments as a set of positive comments and a set of negative comments;

selecting a representative positive comment from the set of positive comments;
selecting a representative negative comment from the set of negative comments; and
generating the opposite standpoints based on the representative positive comment and the representative negative comment.

7. The method of claim 6, wherein the generating the opposite standpoints comprises:
rephrasing the representative positive comment and the representative negative comment, respectively; and

generating the opposite standpoints based on the rephrased representative positive comment and the rephrased representative negative comment.

8. The method of claim 1, wherein the providing the at least one first response comprises:

retrieving a plurality of comments corresponding to the first source content; and
providing at least one comment selected from the plurality of comments.

9. The method of claim 1, wherein the providing the at least one first response comprises:

providing a response to the at least one first message generated by a domain-specific response model, the domain-specific response model being trained within a domain corresponding to the first source content.

10. The method of claim 1, further comprising, for a first message of the at least one first message:

determining that at least one of a first set of predetermined rules is satisfied, the first set of predetermined rules comprising: a number of the at least one first response that has been provided prior to the first message satisfying a first predetermined threshold, and the first message and a predetermined number of previous messages immediately before the first message have low information; and

providing a response to the first message generated by a general response model.

11. The method of claim 1, further comprising:

receiving at least one second message; and

determining that the at least one second message is irrelevant to the first source content;

and

in response to the at least one second message, providing at least one second response.

12. The method of claim 11, wherein the providing the at least one second response comprises, for a second message of the at least one second message:

determining that at least one of a second set of predetermined rules is satisfied, the

second set of predetermined rules comprising: a number of the at least one second response that has been provided prior to the second message satisfying a second predetermined threshold, and the second message and a predetermined number of previous messages immediately before the second message have low information; and

providing an inducement or content summary corresponding to second source content.

13. The method of claim 11, wherein the providing the at least one second response comprises:

providing a response to the at least one second message generated by a general response model.

14. An apparatus for content recommendation in automated chatting, comprising:

a summary providing module, for providing a content summary corresponding to first source content;

a receiving module, for receiving at least one first message;

a determining module, for determining that the at least one first message is relevant to the first source content; and

a response providing module, for providing at least one first response relevant to the first source content in response to the at least one first message.

15. An apparatus for content recommendation in automated chatting, comprising:

at least one processor; and

a memory storing computer executable instructions that, when executed, cause the at least one processor to:

providing a content summary corresponding to first source content;

receiving at least one first message;

determining that the at least one first message is relevant to the first source content;

and

providing at least one first response relevant to the first source content in response to the at least one first message.

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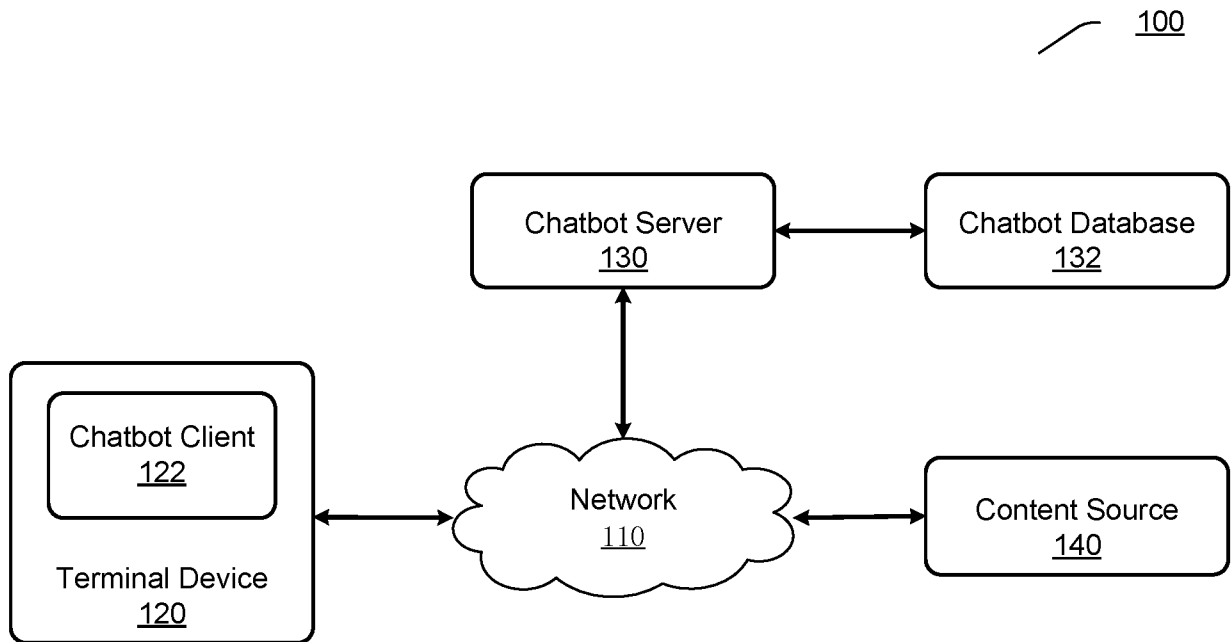


FIG 1

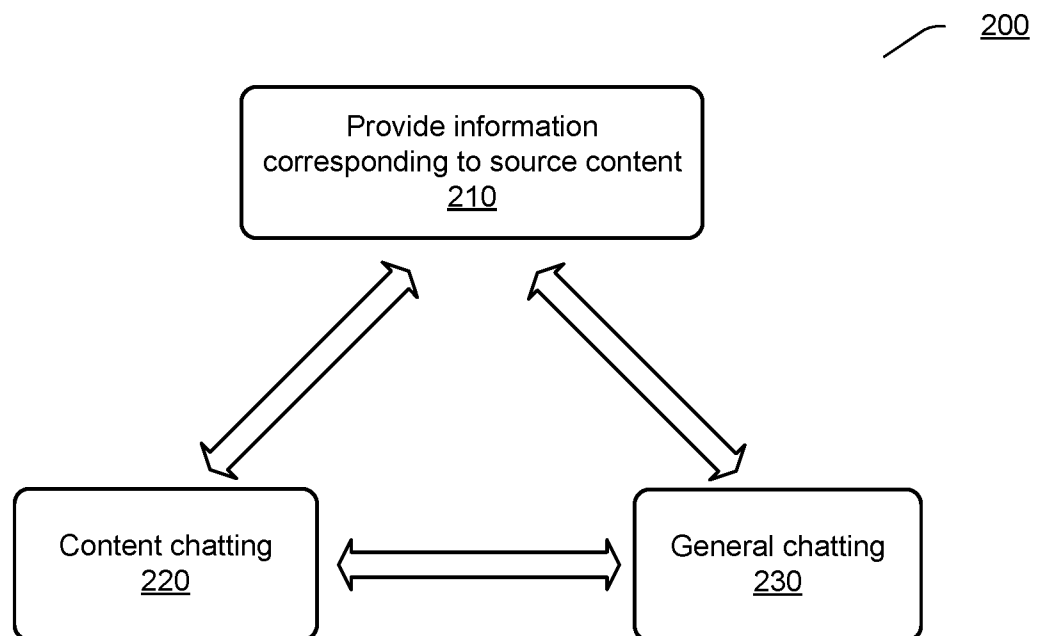


FIG 2

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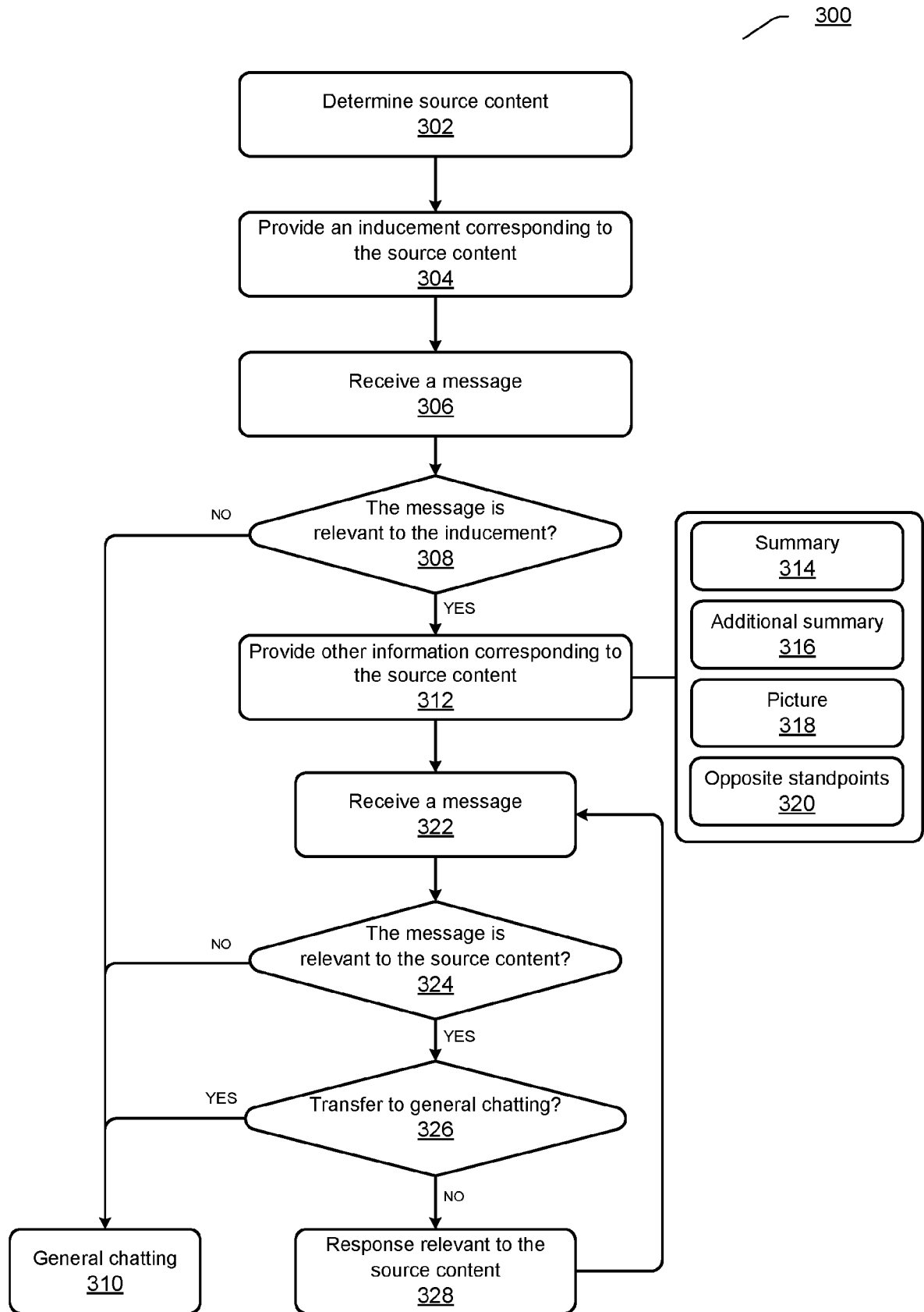


FIG 3

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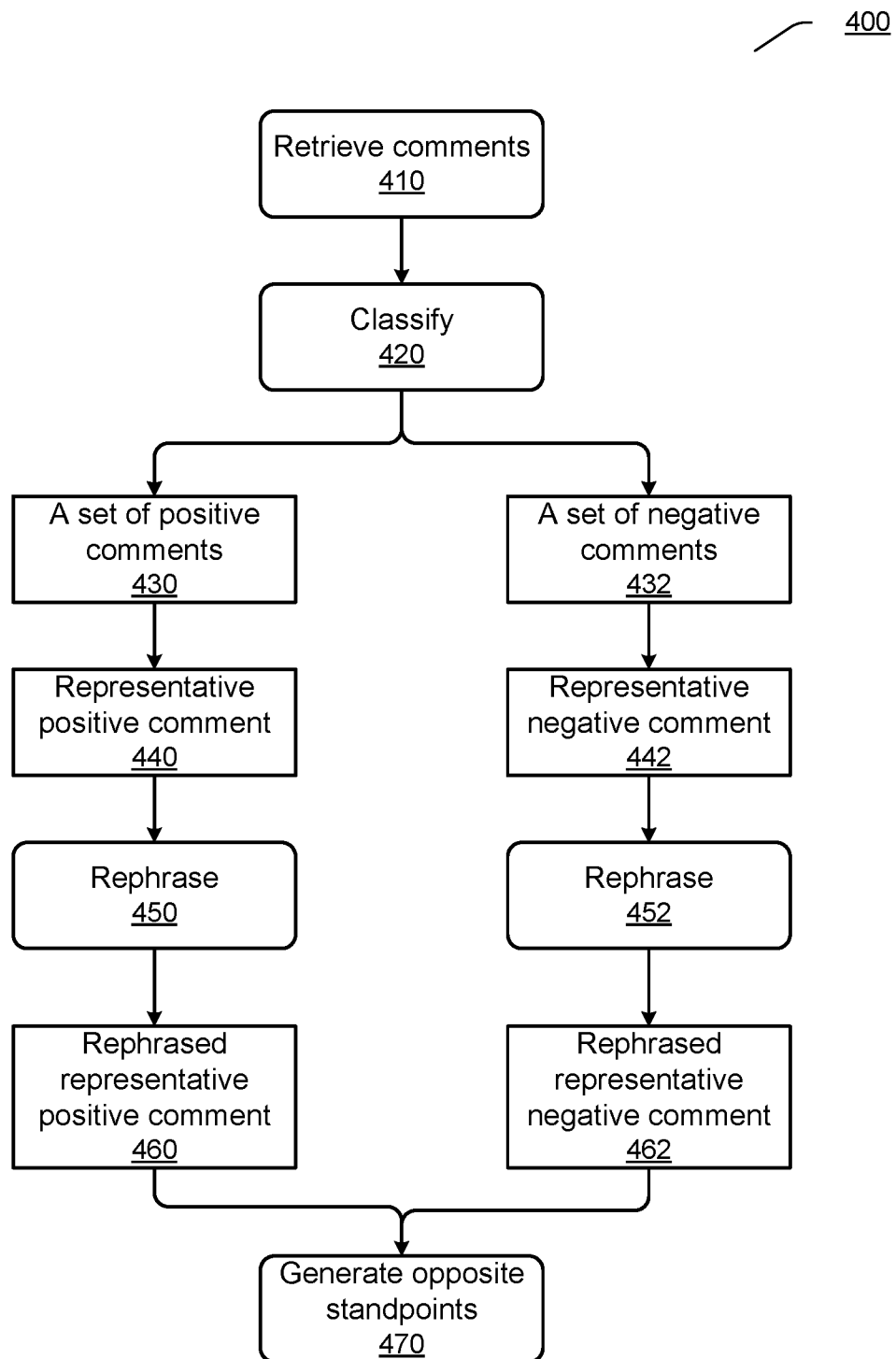


FIG 4

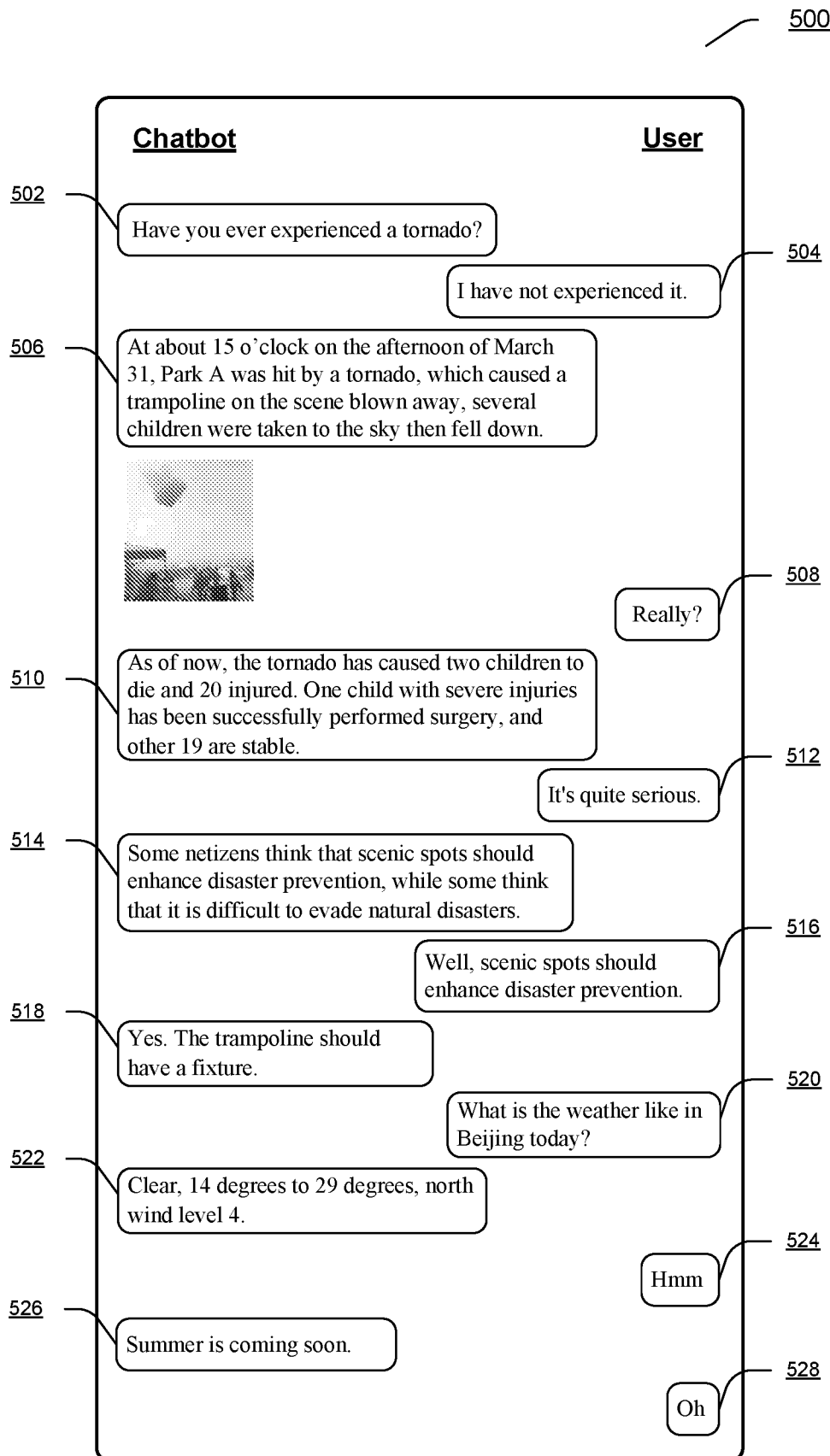


FIG 5

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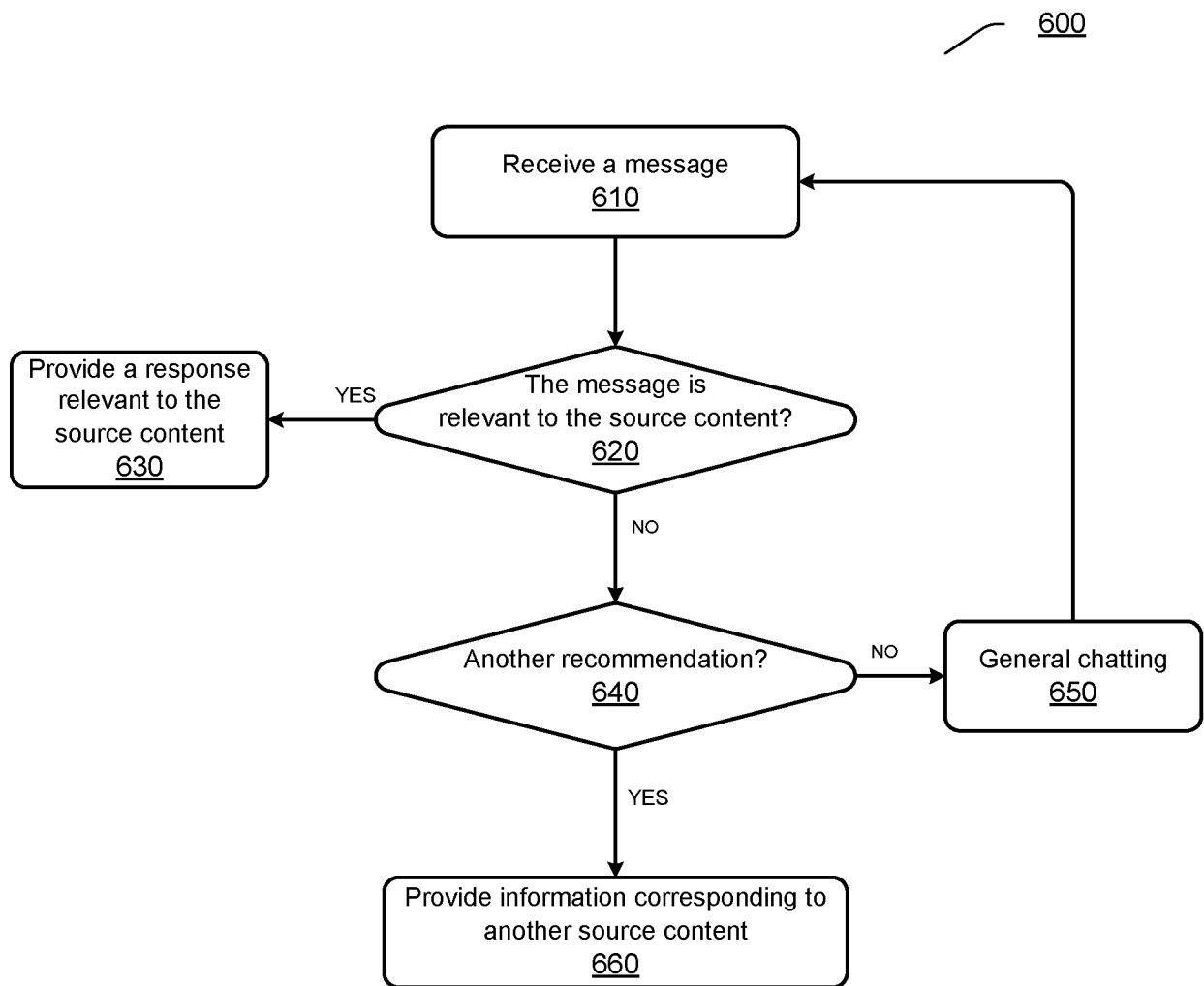


FIG 6

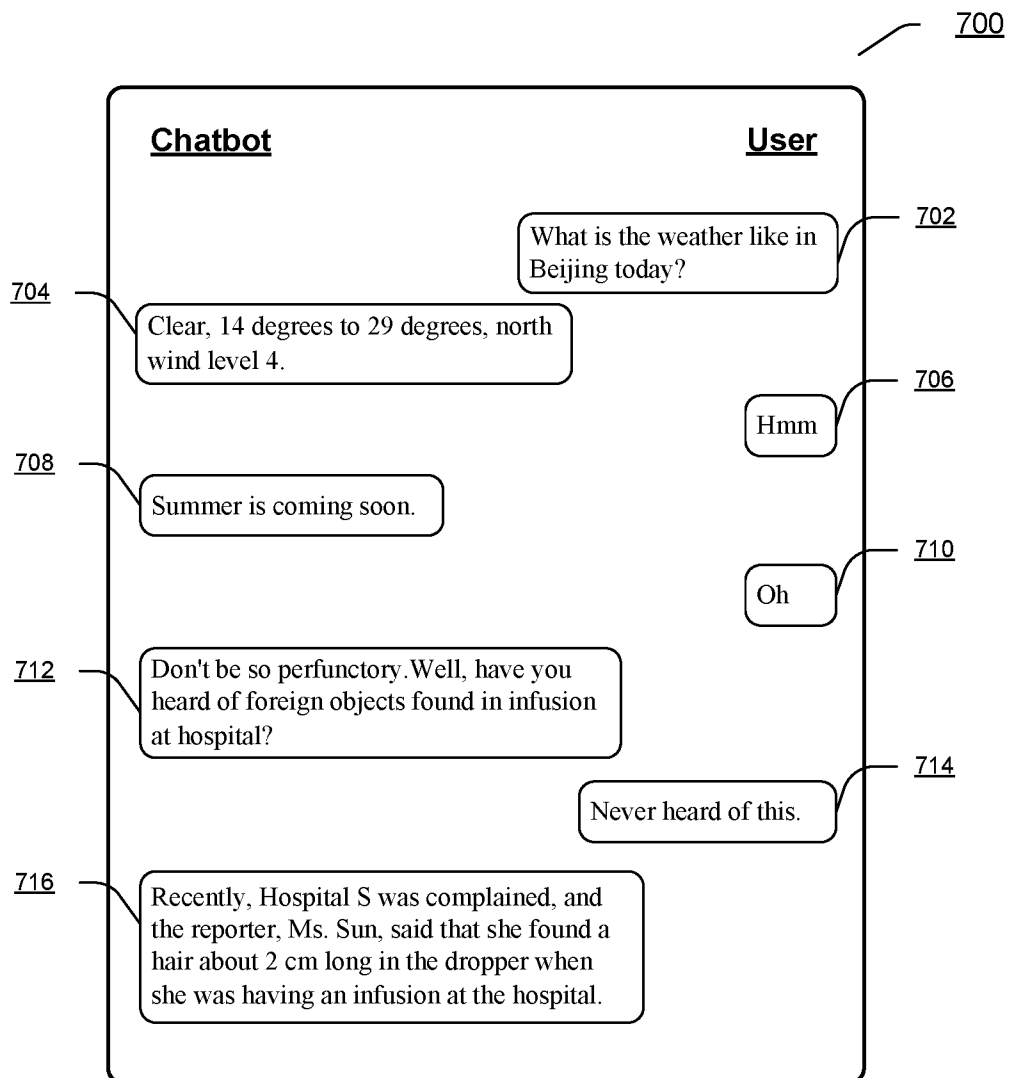
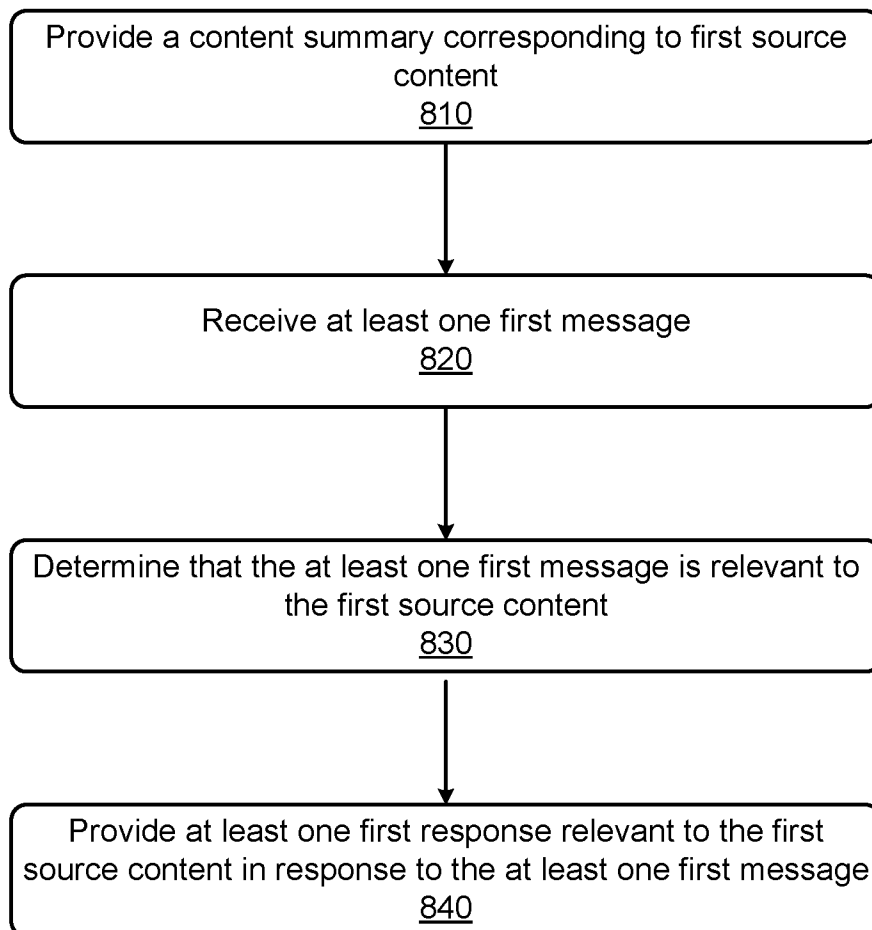
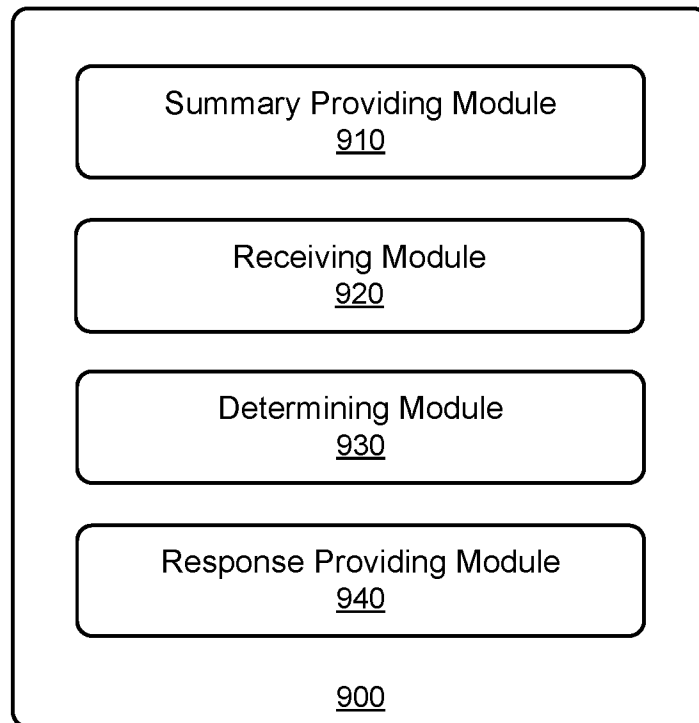
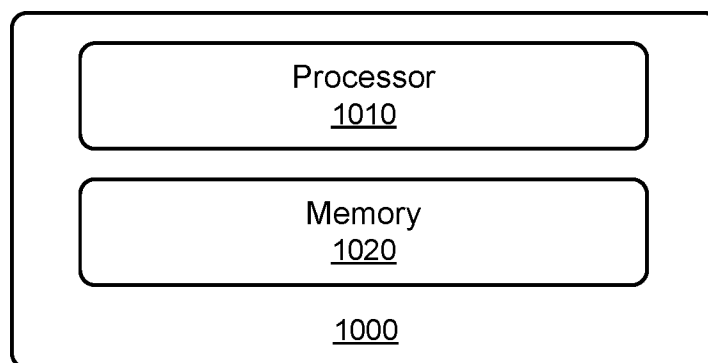


FIG 7

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 800**FIG 8**

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**FIG 9****FIG 10**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/026038

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L12/58
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/176413 A1 (MICROSOFT TECHNOLOGY LICENSING LLC [US]; WU XIANCHAO [JP]) 4 October 2018 (2018-10-04) abstract paragraph [0002] - paragraph [0158] figures 1-15	1-15
X	WO 2018/165932 A1 (MICROSOFT TECHNOLOGY LICENSING LLC [US]; WU XIANCHAO) 20 September 2018 (2018-09-20) abstract paragraph [0002] - paragraph [0134] figures 1-11	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

30 June 2020

Date of mailing of the international search report

09/07/2020

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Authorized officer

Poggio, Francesca

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2020/026038

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