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Automatic annotations in communication applications

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Automatic annotations in communication applications

ABSTRACT

This disclosure describes techniques to insert hyperlinks into user communications (e.g., email, chat, etc.) that can provide a ready reference to other communications relevant to the context. With user permission, contents of email and chat messages are analyzed and classified according to the topics of the messages, e.g., with the use of a trained machine learning model. When a new message is received, it is analyzed and hyperlinks are automatically inserted that enable the user to navigate to other relevant messages.

KEYWORDS

- Hyperlink
- Content annotation
- Email
- Messaging
- Phrase chunking
- Conversation context

BACKGROUND

Communication applications (e.g. email, chat, etc.) are commonly utilized to read and write messages that include unstructured conversation content. Users typically read through the content when it is delivered to them and can choose to store such content. Periodically, a user may need to refer to a previous conversation. Currently, a user can perform a search, e.g., using keywords that match the stored message content.

To perform such a search, the user must remember the context, and identify suitable keywords from the previous conversation. Further, the prior communication may have taken

place via an application that is different from the one in use, e.g. an email might refer to a previous chat conversation.

DESCRIPTION

This disclosure describes a user interface and techniques to insert hyperlinks into user communications (e.g., email, messaging/chat, etc.) The hyperlinks provide a ready reference to other communications that relate to the current communication. With user permission and express consent to access and analyze message content and/or content within a destination application, such data are analyzed. One or more trained machine learning models are employed. The described techniques can be implemented as part of a messaging application, a chat application, or other software applications.
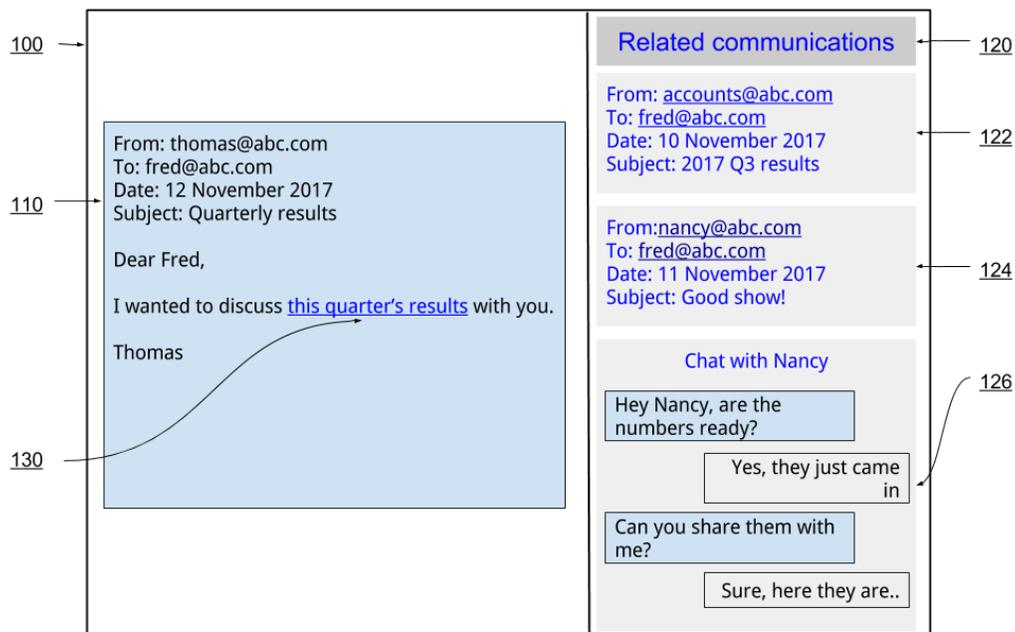
Fig. 1: Hyperlink to other relevant communications inserted in a message

Fig. 1 shows an example user interface that illustrates automatic insertion of hyperlinks within an email application (100). In the user interface, an email message (110) is displayed. When the user provides permission for implementation of the described techniques, the

contents of email and other message (e.g. chat) communication received by the user are analyzed using a trained machine learning model. The communications are classified by the topics mentioned or described in the message. Further, important entities or concepts mentioned in the message are also identified. With user permission, such classification can be performed on a remote server, locally on a user device, or a combination of the two (e.g. emails can be classified on a server and SMS messages can be classified on the user device). The extracted information is stored and indexed for later retrieval.

Hyperlinks to relevant past messages are inserted in new messages received by the user. The hyperlinks are based on the content in the new messages. The message is annotated with terms or phrases that provide a reference to important topics and concepts. A hyperlink can be inserted into messages at the time of receipt of the messages and at the time that the message is opened for viewing by the user. A hyperlink may point back to a single conversation or can refer to multiple conversations that the user can select from. A trained machine learning model is utilized to perform phrase level chunking of content in the new message and to generate the set of annotations that represent the topic. The predicted topic is matched against the message-level topics extracted from prior messages.

In the example illustrated in Fig. 1, it is determined based on analysis of the email message (130) that the message refers to quarterly results. A hyperlink inserted in the new message ("this quarter's results") indicates the topic to the user. The hyperlink enables the user to navigate to other communications about the topic.

Further, it is determined that the user received prior email messages (122, 124) that pertained to quarterly results, and also participated in a chat (126) where quarterly results were

discussed. The set of related communications is displayed (120) to the user to enable the user to select and read one or more of the communications.

Other information can also be extracted at the time of annotation. For example, the date of the communication or the identities of the parties to the communication can be used as a filter to restrict the set of messages that are determined as relevant. If multiple messages match the topic for a given annotation, the user is provided with multiple suggestions when the hyperlink is selected. When a user selects a hyperlink that points to multiple messages, the candidate messages are shown in reverse chronological order to the user. Further, when the parties to the communication use the same or compatible email/messaging system, the techniques described in this disclosure also allow the sender of a communication to insert manual annotations/hints that refer to other messages relevant to a particular communication. The techniques of this disclosure can be used as part of an email application or service, as part of a messaging or chat application, social media applications, etc.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of

a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques for automatic insertion of hyperlinks in email and chat messages. The hyperlinks point to other messages that relate to the same topic or content. With user permission, content in a new message is analyzed, and matched against stored content from past received communications. Hyperlinks are inserted in the new message to enable the user to quickly obtain additional contextual information.