Construction of Support System for E-mail Communications

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1 Background and Purpose

E-mail is one of the fundamental and important communication tools on the Internet. E-mail allows asynchronous communication. That is, e-mail users can send messages anytime without waiting for expected responses. And they can also freely write messages in their own way. Therefore, a speaker (sender) tends to send an e-mail message that includes several topics. Accordingly, several topics would be communicated in parallel in subsequent e-mail messages. In such communication, the speaker and listeners (addressees) will not be able to achieve mutual understanding and result in misunderstanding of conversation. We think that if e-mail users can refer streams of deliberation represented by visualizing sequence of the same topic utterances, they will be able to easily understand the stream of relevant messages. In this paper, we design and implement the system for sharing the deliberation structure (ex. the deliberation stream) to avoid the misunderstanding of conversation among participants.

2 System Configuration

Our system consists of two components. One is an engine to extract and store the deliberation structure from the e-mail messages. We call this *the deliberation structure extraction engine*. The other is a client for referring to the stored deliberation structure. Participants send e-mail messages to the deliberation structure extraction engine to use this system. This engine extracts utterances from sent messages and updates the deliberation structure by adding these utterances. Then, participants can refer to the updated deliberation structure by using our client. We design and implement out system based on the following four design policies.

Policy 1 Our system provides the method of referring to the deliberation structure. The users can trace a deliberation stream back and/or to the recent. This method will be helpful in efficiently communicating.

Policy 2 Our system treats a chunk of an e-mail message as the minimum unit of utterance, and doesn't treat one e-mail message as the minimum unit of utterance. This policy is based on the tendency to send an e-mail message that includes several topics.

Policy 3 E-mail is also used in various environments with restrictions like PDA, STB(Set Top Box), a cellular phone and so on. They will be used in the future, since they have appropriate advantages. Therefore, not all the participants in e-mail communications can use our system's client. Our system doesn't check whether the used client is our system's client or not.

Policy 4 Our system doesn't restrict a participant's expression and doesn't force him/her to input meta-information of their message, such as an utterance intention, because these restrictions may be obstacles to express speaker's intention.

3 Deliberation Trees and UMML+Linkbase

E-mail communication differs from spoken language communication. Therefore, conversation structure model for spoken language communication is not applicable to the e-mail communication as it is. We call *a deliberation structure model* a model to represent streams of relevant messages in email communication. The deliberation structure model treats email messages that include several topics. The deliberation trees is a multi-party deliberation structure model for e-mail communication. This is a model which extended Clark's contribution tree. The contribution tree is one of the conversational structure models in face-to-face communication. A contribution is a unit of conversation created by two processes as follows;

1. The contributor tries to specify the content of his/her contribution, and the partners try to register that content.

2. The contributor and partners try to mutually believe that the partners have understood what the contributor meant for current purpose.

Our deliberation structure model can express formally the following features which appear in e-mail communication. We think that deliberation trees will be useful to visualize the message structure. Our system uses this model.

- A speaker tends to send an E-mail message that includes several topics.

- Several topics may be communicated in parallel in subsequent e-mail messages.

- A speaker tends to build referential expression for the intended participants to understand easily which is related to next sender selection.

- Non-intended participants may respond to the sender even if a sender builds referential expressions for the intended participants.
- A deliberation stream may branch out into some streams when two or more participants respond to one utterance.

UMML+Linkbase are XML vocabularies designed to give the information about deliberation trees to the e-mail messages. It consists of UMML and Linkbase. UMML (Utterances-in-Mail Markup Language) is designed to give an e-mail message the various information about the utterance which appears in deliberation structure. Linkbase is used to express the connection between the utterances included in different e-mail messages. Deliberation structure extraction engine and clients share the information about deliberation structure using these vocabularies.

4 Deliberation Trees Extraction Engine and ICEMail++

Deliberation trees extraction engine extracts deliberation trees from e-mail messages. This engine generates the UMML+Linkbase files expressing the extracted deliberation structure. This engine uses the linguistic clues which appear in an e-mail communication to extract deliberation trees. The used linguistic clues include quotation marks, blank lines, "expression which suggests initiation of new topics", "expression which suggests the topic shift" and so on. This engine uses neither a restriction on messages nor meta-information of messages such as an utterance intention to extract, no longer.

ICEMail++ is the prototype of the client in our system. It is an e-mail client with a deliberation structure reference function. Users can refer to the deliberation trees extracted by the deliberation trees extraction engine if needed, when reading an e-mail. In this paper, two kinds of the presentation method of deliberation structures are proposed. One is called *the table method*. This is the method of storing a table with the utterances included in the one e-mail in the introduction order. And the existence of the former or latter utterances from an utterance in the deliberation trees is expressed by the hyperlinks to the former or latter utterances. Another is called *the tree method*. This is the method of expressing the relation in the deliberation trees from the utterances included in one e-mail by the tree structure.

5 Conclusion

We designed and implemented the support system as one of the solutions of the problem in E-mail communication. Our system consists of the deliberation trees extraction engine and ICEMail++. The deliberation trees extraction engine extracts deliberation trees from e-mail messages automatically. ICEMail++ is the e-mail client equipped with the deliberation structure reference function. We also designed XML vocabularies UMML+Linkbase for sharing the information about deliberation structure. In the future work, we need to confirm whether this system is useful of smooth E-mail communication by actually employing this system.