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Author(s)	,
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Abstract

In recent years, the study of non-task-oriented dialog system that can freely talk with users attracts more research interests, since it can be used for a chat robot or user friendly interface. To appropriately respond to user's utterance, it is important to precisely recognize user's intention. This thesis proposes fundamental techniques to realize smooth conversation between the user and dialog system.

First, a novel method to identify a dialog act, which represents the user's intension, for a given utterance is proposed. In previous studies based on supervised machine learning, a unique set of features is used for classification of all dialog acts. However, not all features may be effective to identify all dialog acts. Some features may be effective for classification of a particular dialog act only, and such features may cause errors for classification of other dialog acts. In the proposed method, an optimized set of the features is determined for each dialog act. Then, binary classifiers are trained with the optimized features for individual dialog acts. Finally, one dialog act is chosen from the results of these classifiers by the several sophisticated methods. The experimental results showed that proposed method significantly improved the F-measure by 0.6% over a baseline that was trained with the unique feature set.

Second it is important to consider a timing of changing the topic in order to continue chat with the user. If the user shows the sympathy for the current topic, the system should continue the conversation with the same topic. On the other hand, if the user does not display the sympathy, the system should provide other topics. This thesis proposes a method to identify if a speaker displays sympathy in his/her utterance. The method is based on supervised machine learning. New features are proposed to train a classifier for identifying the sympathy in user's utterance. A problem for supervised learning of sympathy identification is that a number of positive samples is much fewer than that of negative samples in general, i.e. the sympathetic utterance does not frequently appear in free conversation. To tackle this problem, a filtering process to remove the redundant negative samples is introduced to correct imbalance of the training data. The results of the experiments showed that the proposed features improved the F-measure by 3-4% over a baseline and the filtering of negative samples was effective to improve performance.

Third, an initiative of the conversation is often altered among the user and dialogue system in natural free conversation. To take the initiative, the system is required to produce a sequence of consistent utterance of the same topic. In this study, an anecdote of a person is regarded as a sequence of consistent utterance that can be provided by the dialog system, because the anecdote might be a good topic that attracts user's interest and has suitable length. Therefore, this thesis proposes a method to retrieve the anecdotes of the given person from Web. First, passages that are related to the given person are retrieved by searching relevant web pages with the query "[person] & anecdote" and segmenting the obtained pages based on the analysis of Document Object Model (DOM) trees of them. Then, each passage is judged whether it is the anecdote by several rules based on linguistic features of the anecdote. The experimental results showed that the precision of the proposed method was increased by 11% comparing to a baseline with a little loss of the recall. However, it was also found that deep understanding of the text would be required to precisely filter out non-anecdote passages.

Keywords: Non-task-oriented dialogue system, Supervised machine learning, Dialog act, Sympathy, Initiative of dialog, Anecdote