

Chapter 6

Dialogue Acts and Dialogue Structure

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ABSTRACT

This chapter discusses historical and recent work in dialogue act tagging and dialogue structure inference. Dialogue act tagging is a classification task in which utterances in dialogue are marked with the intentions of the speaker. It is possible to classify utterances using only features relating to the utterance itself (for example, words and prosodic features), but much work has also utilized dialogue-level features such as previous speaker and previous dialogue acts. The structure of dialogue can be represented by dialogue grammar, segmentation, or with a hierarchical structure.

INTRODUCTION

When human speakers engage in dialogue, they construct their utterances to accomplish some joint action, whether exchanging information, or requesting or offering assistance. They arrange these utterances according to well-recognized patterns that help make the flow of dialogue easier to follow. Dialogue researchers are interested in understanding and modeling both the purpose of human utterances and the structure of human

dialogue. In a practical sense, both of these are important in the creation of a conversational agent, or a dialogue manager, used in spoken language systems to track the state of the dialogue and decide what kind of speech acts the system should generate next. Classifying dialogue acts correctly can have a salubrious effect on other aspects of natural language processing, such as automatic speech recognition (Taylor *et al.* 1998). Also, understanding dialogue acts and dialogue structure is a key to understanding what a dialogue is about, an important part of true natural language understanding.

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This chapter gives a brief outline of two important aspects of dialogue modeling: *dialogue act tagging*, which involves interpreting the intentions of a speaker's utterance, and *dialogue structure inference*.

BACKGROUND

Dialogue act tagging (or DA tagging) is a classification task in which utterances in a dialogue are labeled automatically according to the intentions of the speaker. More formally, for each utterance, given the available evidence e , the tagger will try to select the dialogue act d that has the highest posterior probability $P(d|e)$. Then, by Bayes' well-known equation:

$$\begin{aligned} d &= \arg \max_d P(d | e) \\ &= \arg \max_d \frac{P(d)P(d | e)}{P(e)} \\ &= \arg \max_d P(d)P(e | d) \end{aligned}$$

DA tagging involves using data from a dialogue corpus, which has been marked with DA tags by human annotators. Features and machine learning techniques are selected which will maximize the likelihood of obtaining correct classifications.

Table 1 shows an example of text from VERBMOBIL-2 (Alexandersson 1997), a corpus of appointment scheduling dialogues. Note that each utterance has information about the speaker, the words in the utterance, and annotators' opinion as to the dialogue act. Other information is available, including phonetic transcriptions and part-of-speech tags.

Dialogue act tagging is difficult for a number of reasons.

- The same kind of dialogue act can be worded in many different ways. Looking for syntactic cues (e.g. question syntax) will only be of partial help, since requests can appear in statement syntax or question syntax. For example, a SUGGEST dialogue act could appear variously:
 - *Let's go on Thursday.*
 - *How is Thursday for you?*
 - *Is March all right?*
 - *Do you have any time in March?*
 - *Next week would be good.*
 - *Why don't we try next week?*
 - *If it were a little earlier, it would be fine.*

These utterances do have elements in common. They include time words (names of days,

Table 1. An example of dialogue from the VERBMOBIL-2 corpus

Speaker	Words	DA tag
DNC	I have nothing in November	INFORM
DNC	pretty much unless you can do that Wednesday Thursday and Friday	SUGGEST
RGM	no that is bad for me unfortunately	REJECT
RGM	I am <uh> I have got to set up chairs at the county fair <uh>	GIVE_REASON
DNC	all right	FEEDBACK_POSITIVE
DNC	okay	FEEDBACK_POSITIVE
DNC	how about <uh> nothing in October	REQUEST_SUGGEST
RGM	in October let us see	DELIBERATE
RGM	I have got <uh> the second through the sixth	SUGGEST
DNC	no	REJECT

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