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Analysis of user impressions by dialogue system confirmations

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Recently, we use information systems in a diary life with the advance of information technology. Spoken dialogue systems which are able to make a reservation or provide some sight seeing information for people have been being studied. It is considered to be more useful if we can communicate with dialogue systems naturally using spoken languages as we talk to people.

However, there are a lot of unsolved preblems such as incompleteness of speech recognititon, parsing spoken lamguages including repairs and slips, and unnatural interaction. So, it is difficult for us to say that spoken dialogue systems are useful at present.

Regarding the fluency of dialogues, to give a back-channel or confirmation properly is nessesary as we can see in human-human dialogues for communicating fluently. Such approprate responses seem to make spoken dialogue systems more useful.

In this paper, we focus on four types of dialogue system confirmations such as an explicit confirmation, an implicit confirmation, aizuchi, and a total confirmation. The explicit confirmation means confirm repeatedly. The implicit confirmation means not confirm explisitly but confirm in the next utterance indirectly. Aizuchi means confirm with an understandig word such as 'hai'. The total confirmation means confirm totally at the end

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of a dialogue. We then studied how we should control their confirmations in order to make spoken dialogue systems useful for users.

First, we analyzed dialogue transcriptions in Japanese regarding room-reservations in order to make clear how confirmations and aizuchi appear in human-human dialogues.

We noticed that people confirm an important condition (number of people)in the initial stage, and use a total confirmation for specific conditions (number of people, day, and starting time) in a human-human dialogue of making a reservation.

Second, we made a spoken dialogue system for a room reservation task. The system has the initiative of dialogue and responses with 12 confirmation strategies. The 12 strategies are used to make clear how confirmations or back-cahnnels affectuser impressions.

The dialogue system consists of a speech recognizer module and a reservation module. The speech recognizer module converts speech inputs to a sequence of letters, and send them to the reservation module. Next,the reservation module matchs a sequence of the letters from the speech recognizer module to keywords, and makes respones based on the result. A dialogue is proceeded according to a room reservation frame.

As patterns of confimation strategies, we set 24 patterns of confirmation strategies in total. One confirmation strategy is to confirm explicitly for all reservation conditions (number of people, day, and starting time), another is to give back-channels for all reservation conditions, another is to confirm implicitly for all reservation conditions, another is no responses for all reservation conditions, another is to confirm explicitly for two reservation conditions (number of people, day),and give a back channel for one reservation condition (starting time), the other is to comfirm explicitly for one reservation condition (number of people), and give a aizuchi for the rest of reservetion conditions. Besides, we included strategies with the total confirmation to each of the confirmation strategies.

We prepared two kinds of system utterances to each strategies. The system utterance A is "How many people would you like to reserve for?", "What day would you like to reserve?", "What time would you like to reserve from?",and the system utterance B is "What is the number of people you'd like to reserve for?", "What is the day you'd like to reserve?",

"When is the time you'd like to reserve?"

Next, we made an experiment in order to analyze differences of user impressions among confirmation strategies. The procedure of the experiment was as follows: (1) we showed the experiment sheet to each subject. The sheet describes the purpose and the way of the experiment. We didn't give any information at all except the sheet.

(2) We showed subjects a reservation sheet which describes reservation information such as the number of people, the day, the starting time and then asked the subjects to make a reservation with the dialogue system based on the reservation sheet. (3) We also asked the subjects to fill in a quetionaire on a scale one to five at the end of each dialogue. The quationaire consists of 4 questions relevent to user impressions like (1) "Was a dialogue fluent?" (2) "Was a system utterance easy to answer?" (3) "Was a total confirmation nessesary?" (4) "Was a system useful?"

The subjects for the experiment are 12 students (4 men and 8 women) who don't belong to the depertment of information science, and are around 20 years old. They made a reservetion 24 times with the dialogue system of different strategies. We recorded 288 dialogues in all. 35 in 288 dialogues failed to complete the tasks.

As for the evaluation, we considered 4 measures such as the scores of a queationaire, the elapsed time, the number of turn, and the number of repetitive utterance , and analyzed the dialogue data.

Finally, as the result of the experiment, system utterance expressions are one of the important factors for the system usability. The elapsed time, and the number of turn are rarely relevant to the system usability. and, Proper confirmations are also important for system usability and the fluency of dialogue.

As further works, several problems should be considered : which system utterance expressions are effective for the system usability, how we should deal with the initiative of dialogue, and how we should control the timing of system confirmations like barge-in responses.