A Study on Topic Control Method for Robot-Assisted Therapies
~ Dementia Evaluation Using Simple Conversation with Robots ~


Abstract—This paper developed the topic control system for dementia evaluation using simple conversations with a conversation robot. In the proposed method, some keywords in the daily conversation, i.e. norms, were first extracted and destination topic for dementia evaluation was determined based on the relationships among them on the concept space. Evaluation experiments were conducted and the obtained results showed that the proposed method could lead the current topic to the destination topic for dementia evaluation. We also showed problems and further works of this study.

I. INTRODUCTION

The number of elderly people who have dementia has been increasing drastically. This trend would be a big social and medical problem in Japan. Therefore, preventing and improving of dementia is so important.

In this study, we are now developing the dementia evaluation system using a conversation robot for robot assisted therapies. Generally, robot assisted therapy is one of popular therapies for preventing/improving of dementia, and many researches on robot assisted therapies have been reported. In welfare facilities, dementia check tests are also conducted to evaluate stage of dementia progression. Some elderly persons are, however, often very nervous about the tests, as a result appropriate evaluation cannot be realized. In addition, following the tests gives a large burden to medical/facility staffs. Therefore these tests have to be conducted without their awareness of the tests.

In the proposed system, topic recognition and dementia evaluation using daily conversations are employed[1][2]. This paper proposes the topic control method based on distances on the concept space of words. By using the proposed method, appropriate responses were generated to lead the current topic to the destination topic for dementia evaluation.

II. TOPIC CONTROL USING CONCEPT SPACE

Figure 1 illustrates the outline of the proposed method. First, the proposed method recognizes the current topic, e.g. weather, date, health condition etc., from the conversation between an elderly person and the conversation robot by using the topic recognition method in [1]. Next, similarities between the extracted topic and destination topics are calculated based on concept relationships of words. In this paper, we use “Word-Net” as concept dictionary because the relationships between the topics could be expressed as tree structure. The proposed method searches pathways from the current topic and candidates of the destination topic, and the candidate with the highest similarity, i.e. the shortest pathway, is selected as the destination topic. The candidates of the destination topics were preliminary determined based on [2]. After this, similarities between subordinate concepts of the current topic and those of the destination topic are calculated and responses using the subordinate concepts with the highest similarity are generated.

![Figure 1. Outline of Topic Control Using Concept Space](image)

III. EXPERIMENTAL RESULTS

Evaluation experiments were conducted to discuss precision and conversational spontaneity of the proposed method. Five subjects evaluated these points by using questionnaires after conversations with robot and human. The experimental results showed that three conversations were lead to the destination topic smoothly in five test cases. In the case of conversations with human, all conversations were done successfully. After evaluation, some subjects showed the conversations with robot were not enough spontaneous compared with that with human. The proposed method simply determines the destination topic based on similarity, i.e. the length of pathway on the concept space. More investigations about determining similarity would be required to improve conversational spontaneity.

IV. CONCLUSION

This paper proposed topic control system for dementia evaluation using daily conversations. As future works of this study, more investigations about similarity and experiments for practical use would be required.

REFERENCES
