

Application Fields and Innovative Technologies

A Study on Visualizing Social Connections of Older Adults Using a VA Listening Service

D. Kamata, A. Matsukawa, N. Kim, T. Nakata, K. Katagiri, M. Nakamura. *Gerontechnology* 25(s)

Purpose Declines in physical and cognitive function, as well as changes in living environment, reduce opportunities for going outdoors and weaken connections to society. In particular, older adults living alone tend to lose opportunities for casual communication with family and friends, which can gradually lead to loneliness and social isolation. Social isolation among older adults has been consistently associated with adverse health outcomes and increased mortality risk [1]. Although such weakening of social ties often progresses unnoticed, older adults and caregivers may help prevent or reduce isolation if they can become aware of social conditions. However, due to declines in cognitive and memory functions, older adults often find it difficult to accurately recall and organize whom they interacted with, when, and in what context. Given these circumstances, this study aims to develop a conversational agent and a connection-visualization system that naturally accumulates interaction data through daily dialogue. In this study, the VA Listening Service refers to a voice-based conversational agent designed to engage in attentive, everyday dialogue with older adults, primarily focusing on listening rather than task execution [2]. By casually conversing with the agent, interaction information is automatically extracted from dialogue logs, stored in a database, and visualized through a web interface. This visualization externalizes otherwise unseen social relationships and supports early awareness of isolation, helping users and caregivers maintain and strengthen social ties.

Method To develop the conversational agent and visualization system, we focused on three components: (1) collection of 5W1H interaction data through a conversational agent, (2) semantic analysis of interaction logs using a large language model (LLM) to construct a connection graph, and (3) visualization of relationships to encourage behaviors that mitigate loneliness and isolation. The overall system architecture is shown in Figure 1. In (1), daily conversations with the agent are used to capture 5W1H information — when, where, whom, what, why, and how — which is stored as structured interaction logs in the database. In (2), the 5W1H data are semantically analyzed using an LLM to generate a connection graph centered around the older adult. Networks are constructed based on core elements such as persons, places, and activities. In (3), the connections are presented in textual form and as social network-style visualizations to enhance awareness of social relationships and support the formation of new or sustained connections.

Results and Discussion We implemented a system that collects 5W1H interaction information from dialogue with the agent and automatically constructs a relationship graph. Experiments were conducted with two to three participants to evaluate the accuracy of 5W1H extraction and the validity of the generated graphs. Results indicated that daily interaction content was appropriately recorded as structured 5W1H data, and the resulting graphs were able to represent social connections around the user without major error. Furthermore, visualizing extracted relationship information as a text-based view allowed participants to recognize their social ties more clearly. Continued system use also enabled users to track changes in relationships over time, suggesting the potential for early detection of loneliness or isolation and for supporting proactive social engagement. In future work, we aim to implement full social-network visualization and conduct long-term field evaluation with older adults to verify the system's effectiveness in maintaining and enhancing social connectivity.

References

- [1] Saito, M., Aida, J., Cable, N., Zaninotto, P., Ikeda, T., Tsuji, T., Koyama, S., Noguchi, T., Osaka, K., & Kondo, K. (2021, February). Cross-national comparison of social isolation and mortality among older adults: A 10-year follow-up study in Japan and England. In *Geriatrics & Gerontology International*, Volume 21, Issue 2 (pp. 209-214). <https://onlinelibrary.wiley.com/doi/10.1111/ggi.14118>
- [2] Matsukawa, A., Okamoto, H., Chen, S., Saiki, S., Nakamura, M., Yasuda, K., & Katagiri, K. (2024, March). Research on Voice-Interactive Community Event Service to Encourage Social Engagement Among Elderly People at Home. In *IEICE Technical Report*, vol. 123, no. 429, LOIS2023-59 (pp. 62–69). <https://ken.ieice.org/ken/paper/20240314ScBm/eng/>

Keywords: Social Isolation, Virtual Agent, Social Interaction Visualization, Isolation Risk Detection

Address: Kobe University, 1-1 Rokkodai-cho, Nada, Kobe 657-8501, Japan

Email: daitok@es4.edept.kobe-u.ac.jp

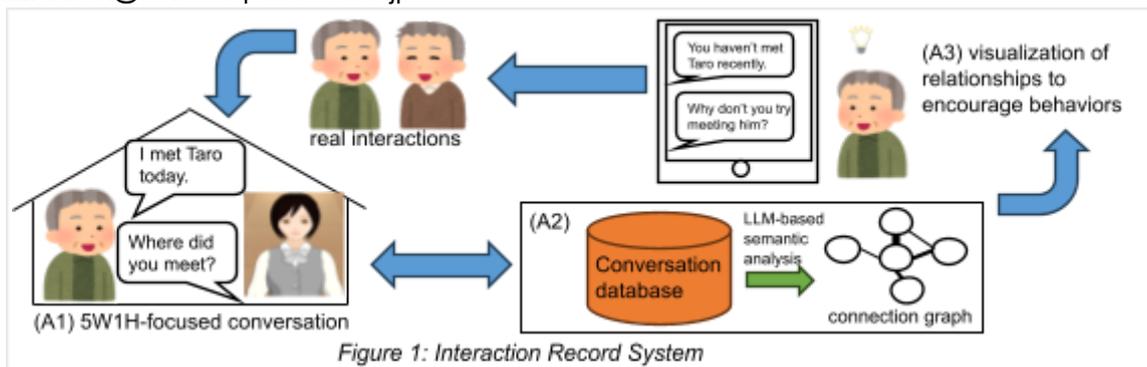


Figure 1: Interaction Record System