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Conversational RAG System Using Practical Dementia Care Knowledge T. Nakata, K. Yasuda, M. Nakamura. *Gerontechnology* 25(s*)*

Purpose Dementia care involves highly individualized needs shaped by personal history, living environment, and familial context, making standardized evidence-based guidelines insufficient for many real-world situations. Practical low-tech strategies used daily by caregivers and professionals are effective but rarely systematized or easily accessible. Moreover, dementia-related consultation is inherently exploratory: caregivers often need a psychologically safe environment to express concerns and consider multiple options rather than receive a single prescribed answer. This study aims to develop a retrieval-augmented dialogue system that structures such practical dementia care knowledge and supports caregivers and people living with dementia in a personalized and context-aware manner. The framework is designed to ingest any dementia-related PDF resource—such as materials from speech-language pathologists or day-care facilities—making it adaptable beyond the specific book used in our demonstration. The applied example uses a book by Yasuda with formal permission [1]. A key objective is to provide not only informational support but also a conversational partner that users can casually talk to, share concerns with, and explore different strategies alongside. **Method** A general-purpose ingestion pipeline extracts chapter–section–paragraph structures from dementia-care PDFs and annotates them with symptom, contextual, and tool-related tags. The overall system architecture is shown in Figure 1, illustrating how the virtual agent interacts with RAG-based practical knowledge and personal contextual information. This produces modular knowledge units suitable for retrieval-augmented generation. The resulting knowledge base is integrated into an existing voice-enabled virtual agent (“Mei-chan”) [2], enabling natural spoken interaction. The backend RAG system provides a two-step interaction format: (1) a concise conceptual summary, followed by (2) multiple concrete strategies tailored to the user’s environment and preferences. The design emphasizes clarity, emotional safety, and avoidance of overly technical explanations. Contextual cues—such as family presence or willingness to use tools—are incorporated into suggestion tailoring, supporting the exploratory nature of dementia consultation. **Results and Discussion** Early simulations and scenario-driven prototype interactions were conducted to examine how the proposed two-step conversational structure supports exploratory dementia-related consultation. The system was able to generate contextually appropriate suggestions for common issues such as medication adherence, sleep-related difficulties, forgetfulness, and agitation by combining brief conceptual explanations with multiple personalized options. This interaction design reduced ambiguity while allowing caregivers to explore different approaches without feeling directed toward a single “correct” answer. Two key design implications emerge from these preliminary observations. First, dementia-oriented conversational systems may benefit from presenting multiple context-sensitive options rather than a single prescriptive recommendation. Second, structuring low-tech practical caregiving knowledge for retrieval-augmented dialogue can enhance accessibility and usability, particularly in situations where high-tech interventions are unsuitable. Although these findings are preliminary and no clinical efficacy is claimed, they suggest that RAG-based conversational interfaces may broaden design possibilities in gerontechnology for individualized, context-rich support.

References

[1] Yasuda K. Rehabilitation for MCI and Dementia: Life Support Using Assistive Technology. Escor Co., Ltd.; 2018.
[2] Okamoto H, Chen S, Saiki S, Nakamura M. Proposal for a Memory Impairment Support Service Integrating Voice Dialogue Agents and ChatGPT. In: Proceedings of the 22nd IEEE/ACIS International Conference on Software Engineering, Management and Applications (SERA 2024); 2024. p. 224-229. doi.org/10.1109/SERA61261.2024.10685623

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Figure 1: System Architecture Based on the Conversational RAG