Developing a smart system encouraging self-aid and mutual voluntary aid for elderly people at home
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Purpose In Japan, the number of elderly people with cognitive impairment is estimated to be over 13 million in 2025. Due to chronical shortage of care resources, the government is shifting the policy from the conventional facility care to in-home long-term care. For this, the Ministry of Health, Labor and Welfare has declared to implement the community-based integrated care systems. It supports the in-home long-term care based on four aids: self-aid, mutual voluntary aid, mutual insurance aid, and public aid. However, it is almost impossible to extend the mutual insurance aid and the public aid. Hence, the key challenge lies in the self-aid and the mutual voluntary aid. The purpose of our research is to develop a practical and affordable system that supports elderly people at home to work on the self-aid and the mutual voluntary aid. **Method** Figure 1 shows the conceptual architecture of the proposed system. Integrating ICT, IoT, and the virtual agent (VA, an animated chat-bot program with voice interactions) technologies, the proposed system tries to capture externally observable events at home, but also to understand the "mind" of the person, including condition, anxiety, intension, and desire. The system then connects the person to information, resources, services, and people, necessary for the self-aid and the mutual voluntary aid. As shown in Figure 1, the proposed system consists of the following three subsystems: (S0) In-Home Care Service Platform: Using the IoT, the platform monitors the status of the elderly person based on the environment and activity sensing. Moreover, the platform conducts mind sensing, which externalizes the internal states of the elderly by words through conversation with VA. Based on the sensing data, the platform constructs a digital twin of the elderly person in the system. (S1) Self-Aid Support Service: It provides applications that encourage the person to solve various problems by his/her own effort. Through the digital twin, the service understands the current status and surrounding contexts in real-time. Depending on the situation, the service actively connects the person to necessary resources, information, services, and professionals. (S2) Mutual-Aid Support Service: It provides applications that create an opportunity of networking with peers. Using the information of the digital twins, the service matches elderly people in similar circumstances. The VA conveys the communication among the matched people. If a relationship of trust is established, the elderly people directly communicate with each other via a chat app or a video call. This creates the mutual voluntary network. **Results & Discussion** We are currently developing the system. In the conference, we present our latest technologies for (S0), including the activity recognition with environment sensing (Niu et al., 2018) and the rule-based mind sensing service (Maeda et al., 2019, p 664-668).

References
Maeda, H., Saiki, S., Nakamura, M., & Yasuda, K. (2019, December). Rule-Based Inquiry Service to Elderly at Home for Efficient Mind Sensing. Scientific paper presented at Proceedings of the 21st International Conference on Information Integration and Web-based Applications & Services – iiWAS2019 2019, Munich. Abstract retrieved from https://dl.acm.org/doi/abs/10.1145/3366030.3366114?casa_token=SdXjJSaeYQsAAAAA:YOJwbXTs47hoOQl__C6WRwe5Luz3RWql0HfWsISWxMbwHC_usAwO0C9okj3VYes13-0CcbVVObOfow

Niu, N., Saiki, S., Nakamura, M. (2018). Using Non-Intrusive Environmental Sensing for ADL Recognition in One-Person Household. Int'l J. of Software Innovation, 6(4), 16-29. https://doi.org/10.4018/IJSI.2018100102
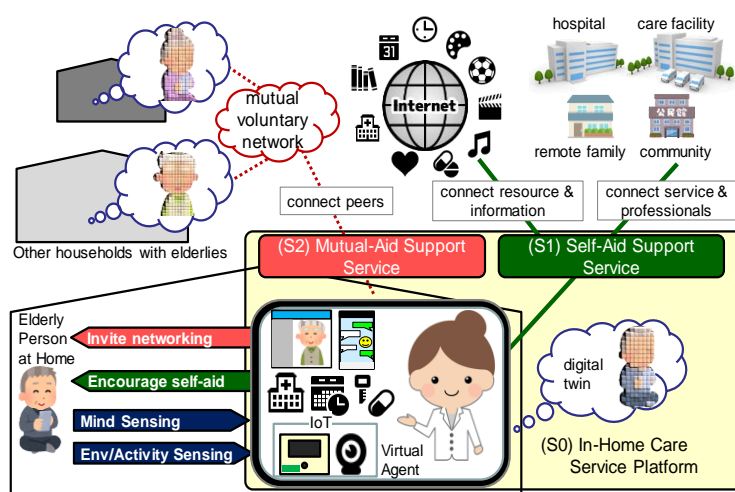
Figure 1. Architecture of the proposed system