

Application Fields and Innovative Technologies

Evaluating the Feasibility and Usability of Human-Care Robot Services in a Residential Apartment Environment: A Daejeon Testbed Study Jeungkun Kim. *Gerontechnology* 25(s)

Purpose The purpose of this study was to evaluate the practical usability and technological suitability of Human-Care Robots (HCRs) when deployed in a typical apartment (APT) residential testbed environment in Republic of Korea. The research aimed to analyze functional success rates, user satisfaction, and identify environmental or technical challenges specific to community living settings for older adults[1][2]. **Method** The research adopted a One-group Pretest-Post-test Design, using a humanoid robot, known as Pepper[3]. The participants consisted of 40 older adults aged 65 and over, residing in the Daejeon APT Testbed. The average age was 73.2 years, and participants lived with an average of 2.1 cohabiting family members. Technical proficiency varied, with relatively higher smartphone skills (Mean 5.9/10) but lower computer skills (Mean 3.9/10). 40 participants used an HCR for 2 hours in a residential apartment and checked whether each function operated properly. Researchers monitored the types of HCR functions used (Table 1), how frequently participants used them, and whether each function worked as intended. Usability assessment was based on safety, operability, and satisfaction metrics developed by the Korea Elderly-Friendly Industry Support Center. **Results and Discussion** Participants generally showed satisfaction with the HCR's role as a companion and life support device, holding a positive image and high trust (e.g., trust score 4.7/5.0). The most frequently chosen necessary functions were Emergency Call (21.7%), Memory Assistance (19.2%), and Item Finding. Functions such as Memory Assistance, Exercise Assistance, and Companion Dialogue achieved success rates of 100% or close to 100%. However, the HCR demonstrated vulnerability within the residential environment. The Environmental Sound Notification service (recognizing sounds like doorbells, phones, or coughs) had the lowest success rate (63.0% in Test 1). Qualitative feedback highlighted that the robot often failed to recognize voice commands due to external noise, such as the sound of cicadas, which significantly compromised the stability of voice recognition in a real living environment. Regarding movement, participants were satisfied with obstacle avoidance (4.7/5.0) but less satisfied with the robot's movement speed (3.9/5.0). These findings suggest that for successful implementation in dense residential settings, HCR technology must urgently improve voice recognition robustness against ambient noise and prioritize the high demand for safety features[4].

References

1. Banks MR, Willoughby LM, Banks WA. Animal-Assisted Therapy and Loneliness in Nursing Homes: Use of Robotic versus Living Dogs. *Journal of the American Medical Directors Association*. 2008 Mar;9(3):173–7
2. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* [Internet]. 1989 Sep;13(3):319–40. Available from: <https://www.jstor.org/stable/249008>
3. Seaman CHC. *Research methods: principles, practice, and theory for nursing*. East Norwalk (CT): Appleton & Lange; 1987.
4. Sætra HS. The foundations of a policy for the use of social robots in care. *Technology in Society*. 2020 Nov;63:101383.

Keywords: Apartment Testbed, Human-Care Robot, Residential Environment, Usability, Feasibility

Affiliation: Research Institute of Senior Industry, Kangnam University, Korea

Email: jkkim@kangnam.ac.kr

Acknowledgement: This work was supported by the ICT R&D program of MSIP/IITP. [2017-0-00162, Development of Human-care Robot Technology for Aging Society

Table 1. 10 types of HCR functions

Conversation Engagement	Environmental Sound Alert	Information Provision	Item Finding	Exercise Assistance
Escort	Emergency Call	Memory Assistance	Content Provision	Companionship Dialogue