

OPP: APPLICATION FIELDS & INNOVATIVE TECHNOLOGIES

Service robot for laundry transport and drink distribution in nursing homes

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Purpose Introduce the potential of service robotics as a solution to challenges faced by retirement and nursing homes due to societal aging and workforce shortages. It outlines a multidisciplinary project examining the implementation of service robotics in elderly care, emphasizing the need to consider various dimensions such as human, technology, business, and law (Seifert & Ackermann, 2020). The main focus is on the robot system Lio and its potential applications in elderly care (Klein et al., 2018), particularly in tasks like laundry transport and drink distribution. The presentation includes the following research question: How can the two tasks of laundry transport and drink distribution be developed and tested within the technical maturity of the service robot Lio and what are the non-obvious challenges that need to be considered in this type of development? **Methods** The conducted method was based on the approach of a two-year research project, as described in Havelka et al. (2021). The method involved identifying challenges faced by stakeholders, such as caregivers and elderly, through observations and interviews onsite. The project progressed through various phases, including understanding, ideation, technology procurement and testing, feasibility testing, application development, and field testing (Döring & Bortz 2016). Each phase corresponded to different Technology Readiness Levels. A comprehensive test concept was developed, and a relational database was used to organize and analysed data from interviews, observations, and test results. This method facilitated scientific evaluation and further development of the project's objectives. During the experimentation and testing phase, two key challenges in retirement and nursing homes were addressed: beverage distribution and laundry transportation, to increase efficiency and reduce the workload of caregivers. **Results and Discussion** Caregivers regularly had to encourage elderly residents to drink, requiring time-consuming journeys between rooms and communal areas. The introduction of the robot Lio (Fig. 1), was designed to reduce this workload by autonomously offering drinks at certain intervals. Through testing, challenges such as limited access to doors and preference for bottled drinks were identified. Solutions included adapting the Lio tray for bottles and exploring options for resident-controlled beverage dispensing. Laundry transportation offered another opportunity to increase efficiency. Caregivers often spent a significant amount of their shift walking back and forth between rooms to deliver and pick up laundry or other things. A robotic solution was simulated to optimize transport. Initial prototypes included simple adaptations such as hitching a bicycle trailer to Lio but required iterative improvements such as stabilizing the trailer and improving Lio's navigation skills to safely navigate with the trailer.

References

- Döring, N., Bortz, J. (2016): *Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften*. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Havelka, A, De Giorgi, N, Frei, J, Früh, A., Lehmann, S., Lohan, K., Lohmann, M., Misoch, S., Nielsen, E., Reinhardt, M., Ruf, E., Wüst, M., Ziegler, M. & Ziltener, A. (2021): "Hey Robot, Where Is My Drink?" – Project Agebots: *Multidisciplinary Perspectives on Service Robotics in the Field of Elderly Care*. Tagungsband. Forschungszentrum Future Aging, Frankfurt a.M..
- Klein, B., Graf, B., Schlömer, I. F., Roßberg, H., Röhricht, K. & Baumgarten, S. (2018): *Robotik in der Gesundheitswirtschaft. Einsatzfelder und Potenziale*. Heidelberg: medhochzwei Verlag.
- Seifert, A. & Ackermann, T. (2020): *Digitalisierung und Technikeinsatz in Institutionen für Menschen im Alter. Studie im Auftrag von CURAVIVA Schweiz*. Zürich: Zentrum für Gerontologie.

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