Development Report:

LISA – A Mechatronic Wall for Assistance with ADLs

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The research project LISA (Living Independently in Südtirol Alto-Adige) investigated the possibilities of embedding assistive functions, systems, and services into wall "terminal" components that enable and support autonomy and independence with respect to Activities of Daily Living (ADLs), and which generate structured environments called Robotic micro-Rooms (RmRs).

Keywords: robotic rooms, service robotics, assistive technology, ageing society

The demographic change with respect to age represents a potential burden to both family and institutionalized care-systems. Novel solutions must therefore be developed to guarantee fully independent living as well as efficient assistance or nursing care in diverse environments for older people [1]. In LISA, the possibility to integrate assistive functions in walls or wall components that generate RmRs is examined, to be retrofitted into older buildings without high reconstruction costs, in order to enable independent and self-determined living for the elderly. Participating industrial partners have gauged the economic potential in terms of mid- and long-term prospects to be very promising, especially considering that all the currently emerging industrial nations are experiencing this kind of demographic change. The project was divided into four stages (1: early user involvement + definition of requirements and functions; 2: mock-ups and testing using an age simulation suit; 3: prototype 1 + technical optimization; 4: prototype 2 + evaluation with real test persons). In every stage, analyses were first performed, followed by an initial concept development, a specification phase, and a final gathering of user feedback and evaluations. Six Life-Centers (i.e., areas where systems-embedded wall terminals were deployed) were identified in an apartment. For example, in the entrance terminal, the following assistance mechatronics and robotics were integrated: 1) intelligent ambient lighting system; 2) mobile rover user-machine interface; 3) air purifier system; 4) tablet PC mobile user interface; 5) RFID-based monitoring and altering system; 6) user vital sign monitoring and alerting system; 7) user functional assistance by robotic actuators. **Fig. 1** gives an overview over the RmR entrance terminal and its functionality. Currently the RmRs for the other mentioned life-centers are under development. These are our key findings so far:

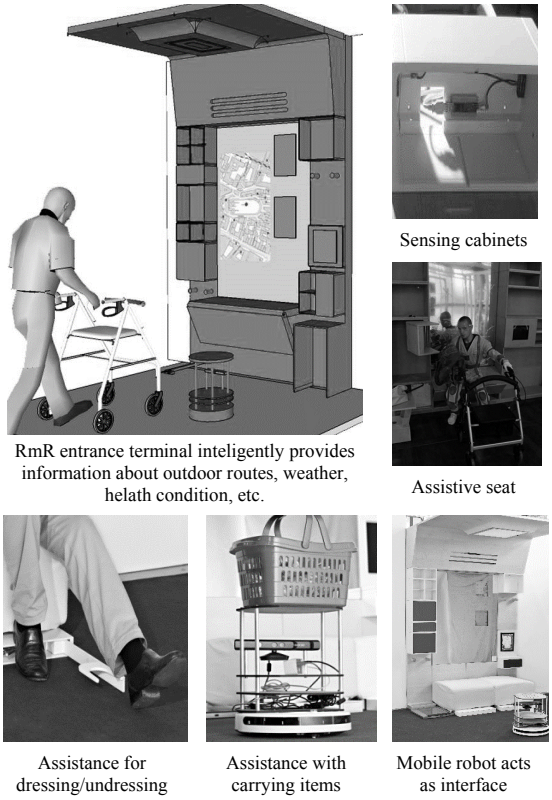

Fig. 1. RmR entrance terminal and its functionality.

1. Built-in functions that serve the user can be used simultaneously to structure the environment for robotics, mechatronic and automated systems and to provide information about objects and their position for other sub-systems.
2. The users are more likely to accept the use of RmRs if they are modular and adaptable to different life-situations and configurations.
3. Apart from the users, the industry also prefers RmRs that install with minimal intrusion to the existing building.
4. An open discussion with users in development stage 4 revealed that innovative and intuitive gesture-driven or speech-driven user interfaces are more appropriate for elderly individuals.

References:

[1] C. Georgoulas, T. Linner, A. Kasatkin, and T. Bock, "An AmI Environment Implementation: Embedding TurtleBot into a novel Robotic Service Wall," Proc. of the 7th German Conf. on Robotics (ROBOTIK), Munich, Germany, pp. 117-122, 2012.