



1 Care-O-bot® 4 can recognize and grip typical household objects.

(Source: Phoenix Design)

2 Care-O-bot® 3 after fetching a drink from the kitchen. (Source: Fraunhofer IPA, photo: Jens Kilian)

3 Care-O-bot® 3 carrying out cleaning tasks. (Source: Dussmann Group, photo: Thomas Ecke)

ASSISTANCE ROBOTS FOR HELPING IN EVERYDAY SITUATIONS AND AROUND THE HOME

Background

The idea of a service robot capable of carrying out unpleasant and tedious tasks around the home is an appealing idea for the majority of people. The elderly, in particular, could benefit from a modern household helper if it enabled them to live longer in their own four walls while minimizing their reliance on others. The same applies to disabled or sick people.

Our solutions

For more than 20 years, Fraunhofer IPA has continuously advanced the development of its product vision of a mobile household assistant called "Care-O-bot®", which is designed to actively support people in their day-to-day lives. The third generation of Care-O-bot® was the first one to feature a near-production-ready system design.

An interactive butler, Care-O-bot® 3 was already capable of carrying out simple assistance tasks in a domestic setting. It was successfully trialled in various research projects both in the private dwellings of elderly citizens and at nursing homes. The latest model, Care-O-bot® 4, is even more versatile thanks to its modular system concept. More particularly, Care-O-bot® 4 technology can serve as a basis for developing tailor-made robot platforms for a wide range of different applications.

At the same time, various research projects have been aimed at better understanding the needs of the elderly and those in need of assistance. In close cooperation with senior citizens and those charged with their formal and informal care, potential areas of use for service robotics have been identified.

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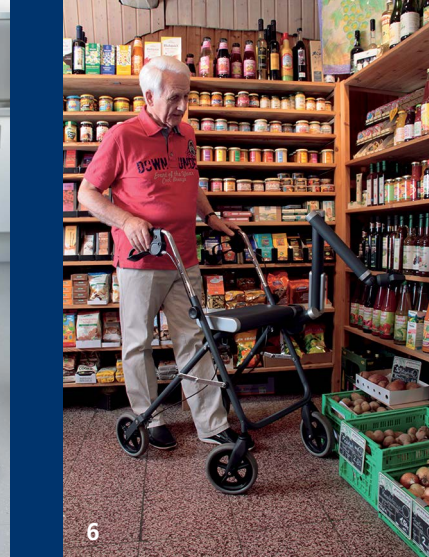
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For the implementation, relevant key technologies as well as complete applications have been developed. The technologies include, for example, intuitive human-robot interaction, 3D image processing (person/situation recognition), automatic gripping of objects and navigation techniques that enable the robot to move safely in an everyday environment. To accelerate the transfer of the developed solutions to real-world use, once successfully trialled the solutions are typically applied to specialized, near-production-ready and cost-efficient prototypes.

Possible areas of application and examples of implementation

Interaction and communication

Mobile assistance robots can be used to encourage mental activity or to provide support in an emergency situation. The emergency assistant "MobiNa" is a small, mobile robot that can evaluate signals from a local fall detection system, make its way to the person who has fallen and, by means of a screen, camera and microphones, allow contact to be established with an emergency call centre. The successor "MobiKa" offers a more comprehensive application spectrum. The multi-purpose communication assistant is equipped with a height-adjustable tablet for interaction. Additional fields of application include telepresence and telemedicine, reminder and activation functions, finding objects or simple transport tasks.

Manipulation aid

Often in everyday life, assistance is required only in specific situations, especially in connection with difficult movements such as bending down or overhead movements. To address this need, a design study has developed the concept for a robotic arm called "AMICO", the basic version of which is attached to a walking frame, although it is also transferable to other locations inside a dwelling, where it can help with typical everyday activities.

Complex assistance robots

A system such as the Care-O-bot® platform, the capabilities of which include autonomous navigation as well as the detection and gripping of objects, can perform a multiplicity of useful actions around the home.

Based on Care-O-bot® 3, the "SRS" project has implemented such services as fetch-and-carry for typical household objects. The commands to the robot, e.g. a command to fetch a certain object, are entered on either a smartphone or the built-in tablet. The robot then makes its own way to the kitchen, where the correct bottle is detected, picked up by the robotic arm, placed on the tray, taken to the user and offered to them.

The "ACCOMPANY" project has implemented specific behaviours – also on Care-O-bot® 3 – that are socially and ethically acceptable to the user, e.g. non-intrusive while keeping a discreet distance.

The project "RoPHa" is concerned with actively supporting older people at the

dining table. For this purpose technologies are getting developed that service robots as the Care-O-bot® 4 can use to prepare, serve and offer meals. The project "ASARob" develops new functions to direct the attention of the users of service robots. Scenarios such as guiding or activating residents in residential care facilities are used for verification.

What we offer

- Performance of customized market/requirements analyses
- Use of existing Care-O-bot® platforms for the development and testing of new applications
- Design and development of new assistance robots to help with an independent lifestyle
- Integration of assistance robots with existing AAL or smart-home solutions
- Incorporation of the technology into existing or new services and processes
- Performance of real-world evaluations, including training of affected groups of individuals
- Transfer of the development results to potential manufacturers as a basis for product realization
- Support with the development of prototypes and serial products

4 Using "MobiNa" to communicate in case of an emergency.

5 "MobiKa" supports telepresence, interaction or reminder functions.

6 The "AMICO" robotic arm is designed to provide assistance with everyday tasks.