

# PRESS RELEASE

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## Service robotics for the nursing sector

### “SeRoDi” research project presents final results

**As part of the “SeRoDi” project (“Service Robotics for Personal Services”), Fraunhofer IPA collaborated with other research and application partners to develop new service robotics solutions for the nursing sector. The resulting robots, the “intelligent care cart” and the “robotic service assistant”, were used in extensive real-world trials in a hospital and at two care homes. This enabled the project partners to confirm the benefits of the robots for reducing the workload of staff.**

Not enough nurses for too many patients or residents: this is a familiar problem in the nursing sector. To address this, there is a need for new solutions that not only reduce the physical and information-management workload of the staff, but also free them up to spend more time with those in need of care. The use of state-of-the-art nursing aids to assist the staff also makes it possible to add to the attraction of the nursing profession while maintaining an adequate quality of care also under challenging conditions. This is where service robots of the kind developed by Fraunhofer IPA and its partners under SeRoDi can be of benefit. The project received funding from the German Federal Ministry for Education and Research.

#### Intelligent care cart summoned at the press of a button

To cut down the legwork of the nursing staff and reduce the time spent keeping manual records of the consumption of medical supplies, Fraunhofer IPA in collaboration with the MLR company developed the “intelligent care cart”. Using a smartphone, the nurse is able to summon the care cart to the desired room, whereupon it makes its own way there. If the room is on a different floor, the care cart can use the lift. A 3D sensor along with object recognition software enables the care cart to automatically register the consumption of medical supplies. If an item is running low or the battery needs recharging, the care cart travels autonomously to the storage area or charging station once this has been approved by the staff. Being of modular design, the care cart can be adapted to different application scenarios and practical requirements. While it served for the transport of laundry items at the care homes, it was used to carry wound treatment materials in the hospital. A further feature of the intelligent care cart: it was always locked, the nurse opening it by logging in on the tablet. This also made it possible for the care cart to transport items that would otherwise have to be stored in a locked room and fetched only when needed.

## Testing in coordinated real-world trials

The care carts developed as part of the project were used in two coordinated multi-week trials at the participating establishments in Mannheim, the University Clinic, the Seniorenzentrum Waldhof and the Ida Scipio Heim. Whereas, at the care homes, the robot was stocked with laundry items directly by the nursing staff on the ward, the care cart used at the University Clinic was integrated into the hospital's extensive logistical processes. The modular baskets containing the dressing materials were restocked at the hospital's central logistics facility and sent to the wards, which meant that all the nursing staff had to do was to replace empty baskets with pre-packaged ones, with no need to put all the items together themselves. To further reduce the workload of the staff, Fraunhofer IPA is currently working on a solution also to automate the changing of the modular baskets.

## Findings from the trials

One important finding from the real-world trials concerned the navigation of the care cart. As the intelligent care cart is based on the navigation processes of a driverless transport vehicle, it travels primarily along fixed predefined paths. For use in public spaces, it is possible to make minor deviations from these paths in order, for example, to dynamically negotiate obstacles in the way. The real-world trials revealed that efficient navigation requires extensive knowledge of the internal processes in order, among other things, to guarantee that the desired destination is actually accessible.

The initial trials also showed that it makes a big difference whether the corridors have a single lane for both directions or separate lanes, i.e. one for each direction. A single lane proved more advantageous, as it was then unnecessary to keep so much space clear along the narrow corridors – even if this meant the robot not stopping immediately outside every room and sometimes having to travel with the drawers towards the wall and not turning until at the destination. For the residents and staff, however, this made it clearer where the robot was going. In addition, restricting the care carts to a single lane ensured that they did not have to make major detours in order, for example, to switch from one side of the corridor to the other.

Evaluating the real-world trials, the participating nursing staff confirmed that, by reducing the amount of legwork, along with the associated time-saving, the intelligent care cart represents a potential benefit in their day-to-day work. Also, the faster provision of care, with no interruptions for restocking the care cart, results in an improvement in quality for patients and residents. Control of the care cart using a smartphone and touch screen was described by the nursing staff as straightforward. In addition to the nursing staff, the residents and patients as well as their relatives showed great interest in the new technology. "Having hit upon the idea of an intelligent care cart already some years ago, and with many potential users having shown great interest in the idea, I was delighted finally to see the care cart in operation as part of the SeRoDi project in the corridors of the hospital and care homes," emphasizes Dr. Birgit Graf, who heads the Domestic and Personal Robotics group at Fraunhofer IPA.

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**Robotic service assistant serves drinks to residents**.....  
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Alongside the intelligent care cart, the robotic service assistant is another result of the SeRoDi project. Stocked with up to 28 drinks or snacks, the mobile robot is capable of serving them to patients or residents. Once again, the goal is to reduce the workload of the staff, in addition to improving the hydration of the residents by means of regular reminders. Using the robot also has the potential to promote the independence of those in need of care.

At the Seniorenzentrum Waldhof in Mannheim, where the robotic service assistant was trialed for one week in a common room, it made for a welcome change, with many residents being both curious and interested. Using the robot's touch screen, they were able to select from a choice of drinks, which were then served to them by the robot. Once all the supplies had been used up, the service assistant returned to the kitchen, where it was restocked by the staff before being sent back to the day room by the use of a smartphone.

This robot, too, received great interest from the participating nursing staff, who also discussed a host of possible improvements and additions to the robot in the course of the trial. Interaction with the residents was successful in the majority of cases, it merely sometimes being necessary for them to be shown how to use the touch screen. The synthesized voice of the robot was especially popular and even motivated the residents to converse with the robot.

**Results of trials pave the way for further improvements**

"For us, the real-world trials provided valuable knowledge, enabling us to further optimize the robots and even better adapt them to the needs of users," says Graf, summing up. For instance, the SeRoDi project has given a major boost to the use of new robotic solutions in the nursing sector. The medium-term goal is to make the improved prototypes ready for series production in collaboration with interested companies. At the same time, Fraunhofer IPA is continuing its long-standing work to open up new applications, including the development of robotic solutions for the nursing sector.

See the project results in a Youtube-Video:  
[https://www.youtube.com/watch?v=dQ5p0h\\_-p4M](https://www.youtube.com/watch?v=dQ5p0h_-p4M)

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**Figure 1 Intelligent care cart:** The intelligent care cart makes its own way to the desired room and is also capable of using a lift. It can be summoned by the nurse from a smartphone, which means less legwork for staff.



**Figure 2 Intelligent care cart:** The care cart is of modular design and can be adapted to different application environments, such as care homes or hospitals. The drawers are locked until a member of the nursing staff logs on.



**Figure 3 Intelligent care cart:** The 3D sensor detects which item was removed. The nurse confirms this on the tablet, which dispenses with the need to keep manual records.



**Figure 1 Robotic service assistant:** The robotic service assistant is capable of operating in common rooms at care homes and hospitals, where it serves drinks and snacks to the residents or patients. This not only reduces the workload of the staff, but also promotes the independence of those in need of care.

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**Figure 2 Robotic service assistant** The service assistant can recognize individuals, take up a position next to them and serve them with a drink while making use of its synthesized voice. The patients or residents can use the touch screen to select a drink, which they then take from the delivery compartment.



**Figure 3 Robotic service assistant** The service assistant can hold up to 28 cups or various snacks. Once they have all been served, the robot returns to the kitchen, where it is restocked by the staff before being sent back to the day room by the use of a smartphone.

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With nearly 1000 employees, the **Fraunhofer Institute for Manufacturing Engineering and Automation IPA**, Fraunhofer IPA, is one of the largest institutes in the Fraunhofer-Gesellschaft. It has an annual budget of approximately 63 million euros, of which more than one third derives from industrial projects. The institute's research focus is on organizational and technological aspects of production. We develop, test and implement not only components, devices and methods, but also entire machines and manufacturing plants. Our 14 departments are coordinated via six business units, which together conduct interdisciplinary work with the following industries: automotive, machinery and equipment industry, electronics and microsystems, energy, medical engineering and biotechnology as well as process industry. The research activities of Fraunhofer IPA aim at the economic production of sustainable and personalized products. We regard cyber-physical production processes as topics of the future.