PRESS RELEASE

A new robot for the healthcare sector transports items to patients' rooms

Fraunhofer IPA has developed a new, flexible transportation robot that specifically addresses the needs of healthcare facilities such as hospitals and nursery homes.

Transport and logistics tasks are part of everyday working life in healthcare facilities. However, they take up valuable staff time that is not available for care activities. Even though driverless transportation vehicles are already being used in many large hospitals, they can only operate in separate supply wings. In addition, some service robots have been introduced, which move about between people and so can help with transportation on a hospital or nursing home ward. However, the larger of these robots, which are used to carry containers, often have difficulties in safely and reliably reaching their destinations through narrow hospital corridors. Using smaller robots can help but to a limited extent, as they can only transport a few individual items.

Safer and more agile robot as underride tractor

Within the "MobDi – Mobile Disinfection" project funded by the Fraunhofer-Gesellschaft, Fraunhofer IPA scientist Theo Jacobs developed a new transportation robot which is set to bridge this gap. Built as an underride tractor, the robot with its chassis is able to drive under various care carts and containers, lift these up and independently transport them to the patients' or residents' rooms in which they are needed.

In contrast to other transportation robots, this new machine uses omnidirectional drives with a special chassis that allows the robot to move sideways. As Theo Jacobs explains: "This is important in order to enable the robot to pick up its load faster and drive toward its destination even in narrow or crowded environments. The chassis also can adapt itself in length and width. As a result, the robot is able to transport care carts and containers of various sizes and wheelbases, and does not need a lot of space to do so. In general, the robot's movements make it intuitive to use because, like a human, it can also move sideways."

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In order to allow the robot to drive among people who have not been trained in its operation, it has been equipped with comprehensive 360 degree sensor technology that can even detect obstacles behind the load from underneath. Cameras and image processing algorithms detect the care carts that the robot needs to lift up and automatically determine the necessary movements for approaching and picking up the load. All the robot needs to know beforehand is the rough position of the cart that it needs to collect.

An important aim was to enable the transportation robot to carry the care carts that are already being used in health care facilities, without the need for complex adaptations. The only requirement is a certain amount of ground clearance for the cart to drive under. One robot is then, for example, enough to automate laundry transportation for an entire care home. If there is time, the robot is also able to carry out transportation services for medications, wound treatment materials and more. Routine transportations can be carried out on a scheduled basis or requested on an ad-hoc basis using a tablet or smartphone. Theo Jacobs explains the robot's application areas: "Depending on the application scenario and integration into established processes in the institutions, the robot can be used for regular patient care or spontaneous support."

Investigating economics

A research team from the Fraunhofer Center for International Management and Knowledge Economics IMW headed by Dr. Marija Radic examined the economic viability of the robot based on a life cycle cost analysis. This includes all costs based on the measured and future achievable performance data and the cost of the robot from purchase to disposal. As a comparative value, the costs of housekeeping staff who only carry out the above transport duties were used. That staff currently spends several working hours every day carrying dirty laundry from all wards to a storage area in the cellar and then distributing the fresh laundry to the wards.

Dr. Marija Radic, Head of Department at Fraunhofer IMW, explains: "If the robot fully takes on transportation of dirty and fresh laundry, it can be used in a cost-effective manner with a depreciation period of three years. It becomes even more cost-effective when it takes on additional transportation services." In this scenario, the robot works around the clock, including charging.

Many years of professional expertise in assistive systems for care work

With this new transportation robot, Theo Jacobs is building on Fraunhofer IPA's many years of professional expertise to develop assistive systems for inpatient care. For example, in 2018, the institute already launched an "intelligent care cart", the end product of the SeRoDi project (service robots for personalized services). It consisted of a rack

with drawers that was mounted onto an autonomously navigating robot platform. Care staff were able to easily document the materials they had used by means of the integrated touch screen and sensor. The modular concept, which has now been implemented, helps to make the robot more flexible and therefore more economical to use.

At the same time, with the new transportation robot, tried and tested solutions from the SeRoDi project can also continue to be used. For example, a stationary care cart that is moved by the transportation robot could be equipped with the appropriate sensors and intelligence in order to automatically record material consumption, prepare care documentation and help order new material. The concept followed for the SeRoDi research project, with pre-packed modular ISO modular baskets, can also be used for storing small items that need to be transported such as care products and wound treatment materials. By replacing the pre-packed modular baskets, it is possible to quickly replenish material that has run out. This helps in particular with the automatic refilling of the care cart, for example in a suitably equipped storage area.

Over the coming months, the newly developed transportation robot is set to be tested in care facilities and, using the knowledge acquired there, the technology will be further developed and optimized accordingly. Parallel to this, discussions will be held with potential manufacturers and sales partners who wish to further develop and sell the robot as a series product in the future.

Profile

Project title: MobDi – Mobile Disinfection
Duration: 10/01/2020 to 11/30/2021
Website: www.mobdi-projekt.de
Project video: https://www.youtube.com/watch?v=_C4IX0Rd8v8
Sponsor: The project was part of the Fraunhofer vs. Corona program that supported numerous initiatives to combat the coronavirus pandemic.

https://www.fraunhofer.de/de/forschung/aktuelles-aus-der-forschung/fraunhofer-vs-corona.html

The newly developed transportation robot can drive under a range of care carts, pick these up and take them to their specified destination.
Source: Fraunhofer IPA/Photo: Rainer Bez

Using their smartphones, the care team can for example order the transportation robot to their desired place of operation.
Source: Fraunhofer IPA/
Photo: Rainer Bez

When the robot is linked to the elevator control system, it can move freely around the building.
Source: Fraunhofer IPA/
Photo: Rainer Bez

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