



1 *rob@work 3.*

2 *rob@work 3 in*

*Industrie 4.0 application.*

## ROB@WORK 3

### Background

Both lightweight manipulators and automated guided vehicles are currently used in a wide variety of industrial applications. Since the workspace of such manipulators is often subject to serious limitations, combining the two systems as a mobile manipulator can result in a significant expansion of the application potential of the overall system.

However, due to their high system complexity – with regard to the integration of both hardware and software – mobile manipulators are usually found only in research environments. What is needed, however, is a platform with real-world capability for mobile manipulation in an industrial environment.

### Our solution

With its Care-O-bot® 3, Fraunhofer IPA has already realized a complex mobile manipulator as a standard platform for the development of a robotic home assistant.

The technological advances achieved with the Care-O-bot® project as well as with the rob@work 1 and 2 industrial service robots served as a basis for the development of rob@work 3.

rob@work 3 combines an omnidirectional mobile base with a modular manipulator system to provide a fully integrated robot that, thanks to its open interfaces and provided basic functionalities, is suitable for effective and versatile use in a production environment.

### Hardware

rob@work 3 integrates the components for all aspects of service robotics into a single platform. For example, 3D camera, stereo camera systems and two laser scanners enable the robot to perceive its environment. The use of various commercially available lightweight arm systems allows rob@work 3 to be used for a multiplicity of manipulation tasks. In addition, the omnidirectional platform offers mobility also in confined environments.

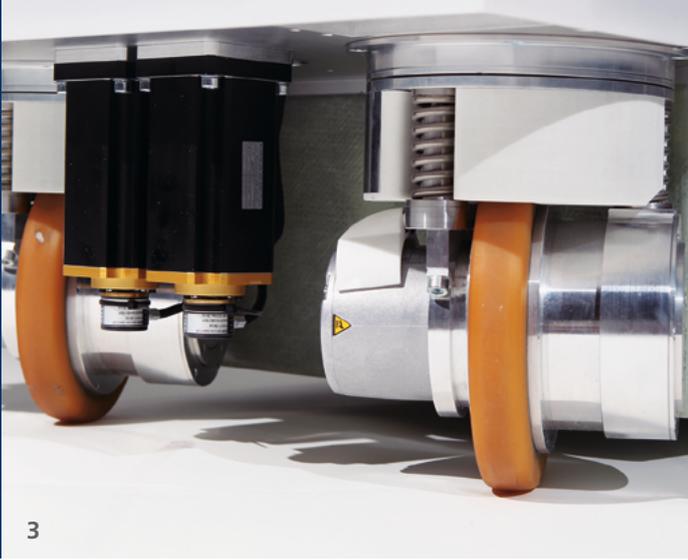
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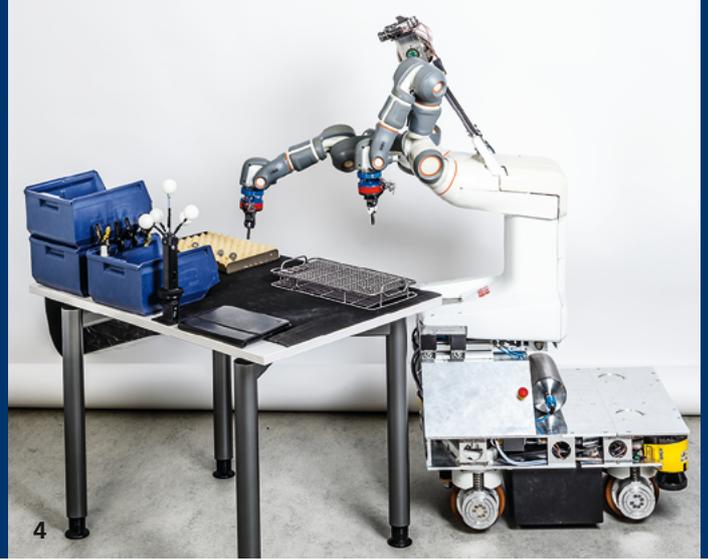
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[www.rob-at-work.de/en](http://www.rob-at-work.de/en)



3



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The use of up to two advanced lithium-ion battery packs guarantees a long operating time of the robot. At 250 kg, the carrying capacity is optimized for smaller loads. Scalability of the construction also makes it possible for the platform to be designed for a higher load-carrying capacity.

#### Software platform

All hardware interfaces as well as all interfaces to the provided basic functionalities of the robot feature open availability as part of the "ROS" open source project. This means that a host of technologies and resources from research environments can be used directly for rob@work 3. In addition, tutorials and standardized programming interfaces give the user faster access to the functionality of the rob@work 3 system.

#### Provided basic functionalities

rob@work 3 already provides profound mobile manipulation functionalities, such as:

- Navigation by natural landmarks, also with simultaneous mapping
- Manipulator control by Cartesian movements as well as interfaces to various path planning algorithms
- Usability of 3D data from stereo vision systems and 3D cameras (e. g. integrated into the navigation system)
- Object recognition

#### Fast application development

The high degree of integration of the platform, in combination with the availability of various basic robot functionalities, significantly reduces the required development effort for industrial service robot applications. Specific, newly developed functionalities can therefore be tested in the overall context of the robot application. In addition, experimental set-ups and feasibility analyses for a host of industrial tasks can be performed faster and more efficiently thanks to the use of the standardized robot platform. The integration of state-of-the-art technologies from the latest research also allows continuous expansion of the system.

#### Our references

##### Care-O-bot®

Fraunhofer IPA has been engaged for almost 20 years in development of a robotic home assistant Care-O-bot®. The technologies and functionalities embodied in rob@work 3 are based on the advances achieved through the Care-O-bot® project. They have, however, been suitably adapted to the specific requirements of an industrial environment.

#### Mobile Production Assistant (PRACE)

The goal of this project was to develop a mobile two-arm assistance system for automation of manual production processes in a manufacturing environment. The project demonstrator is based on the rob@work 3 platform, which allows the partners to focus on development of the key project technologies.

#### What we offer

Fraunhofer IPA will help you to design and develop your industrial service robot applications, especially with regard to the

- implementation of complex application scenarios on the rob@work 3 development platform
- acceleration of your application development processes
- evaluation and demonstration of specific robot functionalities

3 Compact drive modules for omnidirectional platform.

4 PRACE demonstrator: rob@work with ABB YuMi.