

World Robotics Service Robots

2024

incl. Mobile and Medical Robots



Statistics, Market Analysis and Case Studies



World
Robotics
Service Robots

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**World Robotics 2024 – Service Robots
incl. Mobile and Medical Robots**

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We express our most sincere gratitude to all partners!

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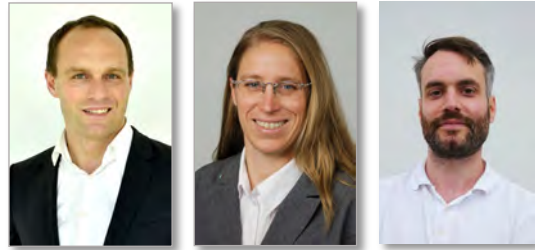
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Foreword

By: Dr. Werner Kraus, Head of the Research Division “Automation and Robotics”



Dr. Birgit Graf and Kevin Bregler,
Research Division “Automation and Robotics”

Dear Reader,

Service robotics is an industry on the move. One trend are bipedal robots or humanoids with gigantic investments in the last months. Whether these robots will be a game changer is still open and so far, no sales could be observed. However, they will serve as a technology base and other robots will benefit from the fast progress in AI, perception, and manipulation developed also for humanoids. One important growing market are autonomous mobile robots with around 300 manufacturers worldwide. This year’s trade fair “Logimat” in Stuttgart/Germany could therefore be seen as the biggest service robotics show in the world. Further interesting markets are delivery robots in restaurants, field robots (however, not at scale so far), mobile assistants in lab automation, and robots for search and rescue or inspection. Here, four-legged robots are on the rise.

Many details about the market and technologies are described in the book at hand. The 2024 edition of “World Robotics Service Robots” presents numbers and market data from the previous year. As was the case in prior years, large growth markets contrast small, highly specialized niche markets, with many startups joining the fray and other companies unable to establish themselves on the market. We continued integrating ten interviews with robot manufacturers from all over the world. This year, we focused on the applications automated truck loading and unloading (as part of AP 51), outdoor intralogistics without public traffic (AP 53), as well as interaction and telepresence (AP 69 and AP 82). The interviews give insights into company strategies, market opportunities, and hurdles that should be overcome to widen the usage of service robots in the mentioned applications. In addition, updates from the market for interaction robots for private use were integrated in that respective chapter (AC 21). Some interesting findings from our chapter updates were the following:

- As far as *truck loading and unloading* is concerned, the manufacturers of such robot applications are addressing a "white spot" in intralogistics. This results not

only from the shortage of labor, but also from regulations such as the break times that truck drivers have to adhere to. It is crucial to create a robust application that can cope with the high demands in terms of flexibility and complexity.

- Developments for *outdoor intralogistics* are all about creating highly customized solutions for specific customer needs, e.g. transporting goods between different production halls. Some of the biggest challenges include adapting to different weather and environmental conditions and ensuring reliable performance on different surfaces (concrete, gravel, etc.). In addition, compliance with strict safety standards and the integration of advanced technologies to protect employees are essential for safe and efficient outdoor operations.
- For *telepresence robots*, the use of “large language models” will certainly be a game changer to further improve interaction via speech. However, full autonomy of these systems is still a distant goal for many use cases. At this year's "Ana Avatar xPrize" challenge, the high level at which semi-autonomous or even teleoperated robotic devices can already act today became clear. Another point is that these devices are primarily aimed at people who are not used to handling robots. Therefore, usability must be high. There are also regulatory requirements, which can be particularly extensive in the medical environment.

In close cooperation, Fraunhofer IPA and IFR are observing 921 companies worldwide offering service robotics solutions (amongst them are about 8% startups). Both, the professional and the consumer service robotics domain benefit from technical innovations like digitization, cloud technologies, 5G/6G and artificial intelligence, specifically in machine learning, that lead to a technology push in service robotics. For the mentioned AI technology, there is already a variety of generative AI tools on the market. Generative Pre-trained Transformers using large language models, e.g. ChatGPT, will turn service robotics inside out, for example in terms of intuitive operation or support for creating program code. After less than two years, it is already clear that generative AI has become an integral part of everyday working life – especially for software development, as software code is highly formalized and widely available on the web serving as training data.

“World Robotics Service Robots” has established itself as the widely acknowledged reference publication in statistics, forecasts, market analysis, and profitability of robot investments. Robot suppliers, media, government bodies, financial analysts, and technology scouts are among its readers. It specifically provides profiles of the numerous service robot manufacturers worldwide. The many hyperlinks pointing to online resources invite to further investigate topics of interest by looking into selected publications and company websites. We are indebted to our colleagues editing the yearbook: Winfried Baum, Simon Baumgarten, Nikhil Srinath Betgov, Dr. Florenz Graf,

Dr. Theo Jacobs, Florian Jordan, Max Kirchhoff, Dominik Moss, Cagatay Odabasi, Tobias Rainer Schaeffe, Ph.D., and Miriam Schmelzer for their valuable editorial work. Furthermore, we highly appreciate the support of Dr. Anne Jurkat from IFR and Dr. Karin Roehricht from Fraunhofer IPA in preparing the report.

In case you have any suggestions or further inquiries related to service robotics, please do not hesitate to contact us!

Best wishes,

Dr. Werner Kraus, Dr. Birgit Graf, Kevin Bregler