



# ZIM Success Story

Central Innovation Programme for SMEs

Cooperation Projects 154



## Reliable Service Robots Now Coming to Restaurants

**Key technologies are being developed that make it possible to manipulate mobile robots. Here, a flexible control system capable of force regulation has combined a range of functions designed to guide mobile robots. In addition to motion control, it facilitates path planning, obstacle avoidance, localisation, and human-machine interaction.**

In many industries, the idea of working without autonomous robotic systems is already nearly unthinkable. Despite the numerous safety measures in place, however, the use of such systems still presents some hazards for human operators. The newspaper reports on such tend to have a similar refrain: “Just this past July, an employee was fatally injured while working on a robot...”

Developers of robotic control systems around the world face the difficult task of identifying as many potential dangers as possible in a given application area and translating this knowledge into safe control programmes. Among other aspects, flexible force control and autonomous navigation are two fundamental components of service robotics development. Corresponding solutions were recently developed as part of the IraSME-ZIM

project “AICISS – Accelerating the Innovation Cycle in Service Robotics”.

In this endeavour, the Bonn-Rhine-Sieg University of Applied Sciences (H-BRS) shouldered the development of sub-functions in motion control (localisation and human-machine interaction in particular), as well as methods of online monitoring and system diagnostics. Intermodalics BVBA (Belgium) was responsible for the real-time aspects of sub-functions provided by the system’s navigation component, along with its 3D imaging capabilities. Meanwhile, Locomotec GmbH contributed to the effort to develop the navigation component, its sub-functions for flexible force control, and other areas.

### **The product and its innovation**

The initial result of this transnational research cooperation was an innovative,

force-control-based system for youBot, one of the robots designed by KUKA. During the development phase, motion control, path planning, obstacle avoidance, localisation, human-machine interaction, and other robotics functions were integrated into a navigation component that enables this service robot to operate safely for extended periods – even in dynamic environments with large numbers of people. Among other target areas, the project team wanted this technology to support usage in restaurant service robots.

The insights that were incorporated into this endeavour included those provided by the European joint research project BRICS (“Best Practices in Robotics”), which were then expanded to make them commercially viable as a standalone technology.

Electro-Measurement,  
Sensor Technology, Robotics



Restaurant service robotics from Locomotec GmbH

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This project was conducted as part of an IraSME call for transnational R&D endeavours. [www.ira-sme.net](http://www.ira-sme.net)

While it continues to be fine-tuned for this area of use, the navigation component developed in the AICISS project is already seeing use in a number of Locomotec's own service robotics applications. The company's product portfolio ranges from mobile info terminals for public buildings to logistics systems for hospitals. One of its focus areas involves flexible robotics systems that adapt intuitively to human environments. Such expertise is enabling Locomotec to solidify its reputation as a system integrator and application developer in the growing service robotics market.

The highly variable and dynamic settings these applications have to support make continuous and autonomous robot operations especially challenging. The AICISS project thus identified a number of essential requirements in order to avoid errors early on in the development process and eliminate other specific flaws during operations using monitoring and diagnostics tools.

### Market and customers

While certain hardware components were still required during the AICISS project, Locomotec addressed this dependency by developing a custom robotics platform. In addition to providing a new basis for the company's own robotics systems, this platform is also facilitating the implementation of numerous new applications. It will soon be introduced and marketed as a standalone product, as well.

### The partners

Founded in 2010 in Landsberg am Lech, Germany, Locomotec GmbH and its seven employees sell smart fitness and training products and mobile manipulators used in object handling and transport.

The Department of Computer Science at the Bonn-Rhein-Sieg University of Applied Sciences conducts research and offers curricula in two bachelor's programmes (computer science and information systems management) and two master's programmes (computer science and autonomous systems).

Intermodalics BVBA of Leuven-Heverlee, Belgium, develops software for robotics solutions in 3D imaging and reconstruction, 3D robotic simulation, and collision detection. The company also offers applications in the fields of real-time robot control, machine learning, fieldbus usage, and large-scale communication networks. Since its foundation in 2010, Intermodalics has grown to employ 25 people.

Project duration: January 2014 to June 2015

This project was supported by the Federal Ministry of Economic Affairs and Energy on the basis of a decision by the German Bundestag.

The Central Innovation Programme for SMEs provides funding to all technologies and sectors.

- Individual ZIM projects
- ZIM cooperation projects
- ZIM collaboration networks

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## Imprint

**Publisher**  
Federal Ministry of Economic Affairs and Energy (BMWi), Public Relations Department  
11019 Berlin, Germany  
[www.bmwi.de](http://www.bmwi.de)

**Last update**  
May 2017

**Design and content**  
AiF Projekt GmbH

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Page 2: Locomotec GmbH