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Our Research Expertise

Robot Oriented Design & Management



Building Component Manufacturing (BCM)



Large Scale Prefabrication (LSP)



Site Logistics and Single Task Construction Robots (STCRs)



Our Vision

Automated manufacturing technology that accompanies a shift from an arts and crafts based industry to an industry based on systematization and machine technology needs to be able to not only improve or double productivity, but to multiply performance (e.g. reduction of construction time to 1/10th compared to conventional construction, zero-waste, and defect free products). We envision a construction industry which is able to produce or change

Automated/Robotic On-site Factories



Hummanoids & Exoskeleton Technology in Construction



Automated Deconstruction, Re-Customization & Recycling



Automation & Robotics in extreme Environments



buildings according to customer demands with minimal delay in a near real time manner. Individual subsystems of the on-site factory, as well as sensor systems necessary to guide automated logistics and positioning operations on-site, can be integrated as building technology into the building and re-activated for change, recustomization and deconstruction during the building's life cycle. This idea we formalized into a life-cycle and building integrated manufacturing concept.

TUM
Technische Universität München
Fakultät für Architektur
Lehrstuhl für Baurealisierung und Baurobotik

Automated & Robotic Construction

Approach & Vision, Research Expertise, Selected Projects

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Approach

Productivity and efficiency in the conventional labor based construction industry in Germany, Japan and the USA has been declining for about two decades. In comparison, productivity and efficiency in most other industries (e.g. in the manufacturing industry) has constantly been on the rise during that time period. The decline of productivity since the 1990s has coincided with a worldwide re-orientation in construction from technological based construction towards labor based management and organization oriented approaches.

As of today, major construction companies and many other practitioners and researchers have been seeking the solution for better productivity in construction, and even again increasingly in better management and organization of the conventional laborintensive construction method. However, this approach sharply contradicts the logic and possibility of industrial and technological advances in manufacturing and only generates marginal improvements. Therefore, our institute follows a radically different approach by focusing on the deployment of automation and robot technology on all levels in construction. We see the construction industry as a manufacturing industry that can produce products with highest efficiency on bases of the best available technologies.

Novel manufacturing technologies in construction and in particular radical solutions require drastic and co-adapted change of manufacturing, technology, organization, products and associated business models in construction. Although the necessary changes and resources are enormous, they can be accomplished on basis of so far developed technologies. The overcoming of associated challenges can eventually turn the construction industry into an incubator for future manufacturing technology.

Our Research Facilities

Construction Robotics Laboratory



Since 1990, a multitude of automated high-rise sites have been operated by various Japanese companies in Asia. Also in European construction firms, flexible site-automation systems have been adopted nowadays. Most of these achievements have been obtained by highly experimental research approaches. Therefore the Construction Robotics Laboratory and the Teleconstruction Site in Garching are designed as an experimenting laboratory, i. e. an „Incubator“. Incubators are used in innovation science and the R&D-industry to specifically generate inventions or to systemize the invention process.

Teleconstruction Site



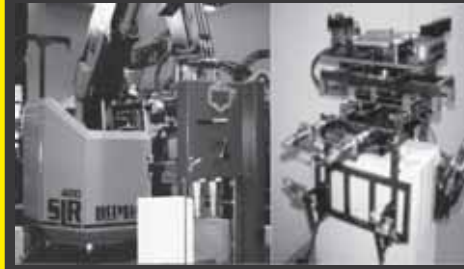
Tele Construction Experimenting Site is an experimenting site located at Garching Campus, used for multiple purposes. The site is open for students and researchers to implement mock ups, experimental buildings, tele-construction experiments, distinguish and apply various demonstrator/prototype evaluation methods, use evaluation feedbacks for further development of the project in subsequent evaluation-development cycles.

Selected Projects

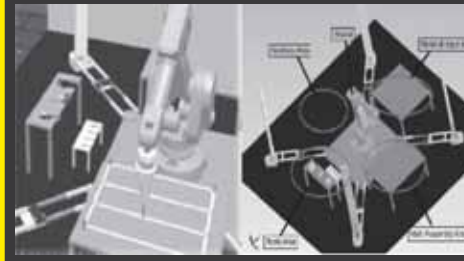
R&D: SMAS (Solid Material Assembling System)



R&D: ROCCO (Robot Construction System for Computer Intergrated Construction)



R&D: ManuBuild - Open Building Manufacturing



Strategic Consultancy: Sekisui Chemical Corporation, Housing Division (Sekisui Heim), Japan



Technological Consultancy: Robotic and Crane based Automatic Construction System (RCACS), Korea



Empiric Studies: Automated Deconstruction & Renovation



R&D: SMARTSITE – Smart and Autonomous Construction Equipment.



Future Concepts Development: Real-Time Construction



Announcing Our New Additions to The Cambridge Handbooks on Construction Robotics Series!

About this series

The Cambridge Handbooks on Construction Robotics series focuses on the implementation of automation and robot technology to renew the construction industry. Volume 1 will be available May 2015, Volume 2 August 2015, and Volume 4 will be available in October 2015. Volumes 3 and 5 will publish in 2017.

Volume 1: Robot-Oriented Design and Management introduces the design, innovation, and management methodologies that are key to the realization and implementation of the advanced concepts and technologies presented in the subsequent volumes.

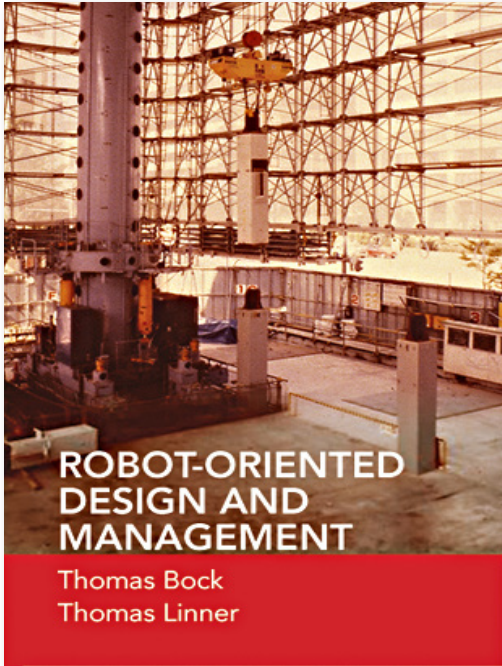
Volume 2: Robotic Industrialization outlines technologies in building component manufacturing based on building materials and large-scale prefabrication holding the potential to deliver complex components and products which are introduced and discussed.

Volume 3: Construction Robots shows that single task construction robots can be used for a variety of tasks ranging from digging, facade painting, interior finishing to inspection, maintenance and deconstruction.

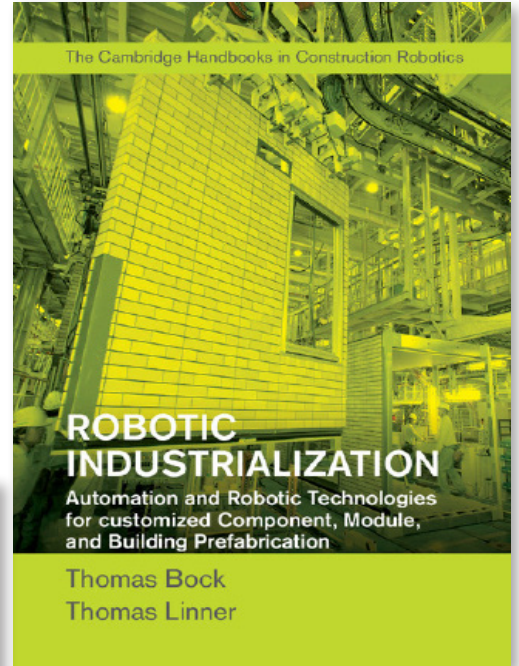
Volume 4: Site Automation extends the new technology of robotics in building-component manufacturing and construction introduced in earlier volumes to on-site structured environments and on-site automated factories.

Volume 5: Ambient Integrated Robotics focuses on the relationship between improvement of production processes and enhanced product performance, including robot-oriented design and management, and usability and customer inclusion within the industry.

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Available May 2015



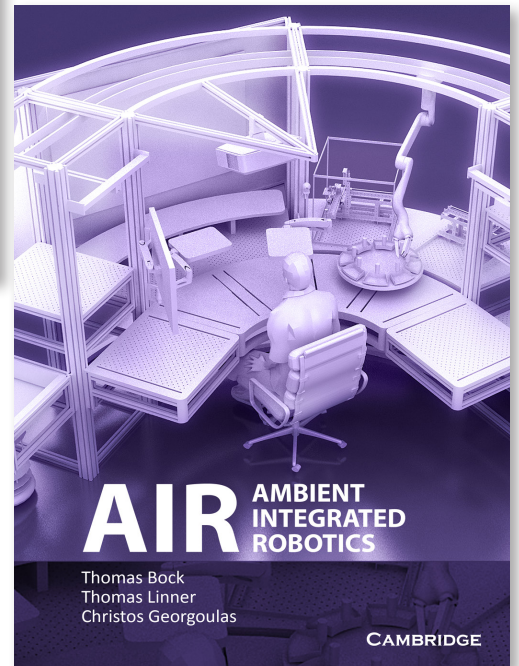
Available August 2015



(Cover not Finalized)
Available 2017



Available October 2015



(Cover not Finalized)
Available 2017