CONBENE
IMPROVEMENT NEVER STOPS

Project Study

“Deviation control using BIM and Robotics on construction sites”

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Topic

Rapid advancements in robotics, computer vision, BIM technology, and generative planning enable new opportunities for **autonomous on-site monitoring and digital assistance**. A future construction-site robot could traverse uneven terrain, track activity progress, assess built quality, gather workers’ feedback, and assist in the problem-solving process. Rather than executing construction work, such robots could act as **autonomous data gatherers** that maintain a continuously updated understanding of the site. However, substantial technical challenges remain, from spatial location and visual recognition to BIM integration and real-time decision-making.

The project study focuses on the following question: **“How can a humanoid robot bridge reality and information systems to effectively gather data and assist on a construction site?”**

Thereby, among others, the following questions are crucial:

- What baseline reference data and real-time sensory inputs are required for a robot to reliably perceive, understand, and navigate a dynamic 3D environment such as a construction site?
- How can static reference models and on-site observations be fused into a coherent spatial understanding?
- How can a robot autonomously derive actionable on-site inspection tasks by integrating construction schedules and task-management systems and integrate them with a BIM model to know where to go and localize itself with sufficient precision to execute them?
- How can it, based on said self-determined inspections, determine what needs to be checked and which expected reference states it should verify?
- What sensing strategies, data-collection routines, and autonomous behaviors must a humanoid robot employ to capture the information required to locate itself on the construction site and for reliable progress, quality, and safety assessments?
- What infrastructure, computing architectures, and connectivity frameworks are necessary to support real-time perception, navigation, and data processing for such a robotic system?
- What technical risks, limitations, and integration challenges arise in the development and deployment of humanoid robots for autonomous monitoring and management on construction sites?

Deliverables:

- A comprehensive report including:
  - State-of-the-art overview of humanoid robotics for autonomous site monitoring.
  - Analysis of required reference data, on-site sensory inputs, and methods to fuse BIM, schedules, and task systems into actionable robot tasks.
  - Framework for translating BIM elements, construction schedules, and task lists into daily inspection targets and expected reference states.
  - Concept for autonomous navigation, localization, and data-capture strategies in dynamic environments.
  - Proposal of system architecture: perception, planning, data synchronization, and digital twin alignment.
  - Evaluation of technical feasibility, integration challenges, and associated risks.
  - The way forward!!

Requirements:

- Analytical, engineering-oriented working style.
- Study focus on Robotics, Mechanical Engineering, Computer Science, AI, Mechatronics, or similar.
- Experience with robotics concepts, BIM, ML/AI models, or simulation tools (ROS, Gazebo, PyTorch, etc.) is an asset.

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Join our journey:

Are you looking for outstanding teamwork and always excited about new challenges? Are you keen on working on future topics in Lean Management consulting? Then you have come to the right place!

Become part of the CONBENE Improvement GmbH success story by joining us **for 3-4 months full-time / 4-6 months half-time in a team of 2-5 students** (M.Sc. or B.Sc.) as part of your academic curriculum.

Please send your application exclusively by e-mail and include all supporting documents to:
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About CONBENE Improvement GmbH:

Our mission is to continuously enhance performance in the construction, plant engineering, and prefabrication industries - because 'Improvement never stops.' Our clients are doers, creating tangible value. We are not just consultants, but true operational partners embedded within companies and project organizations. Together with clients, we actively engage in the work. Customer satisfaction is our driving force; Lean is our business. Our approach combines advanced project management, lean principles, and digital solutions to create a unified, transparent, and highly efficient environment. Unlike traditional project management firms, lean consultants, or software providers, we integrate these disciplines into a systematic, holistic framework or toolchain, delivering superior results."

Please send your application exclusively by e-mail and include all supporting documents to:

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