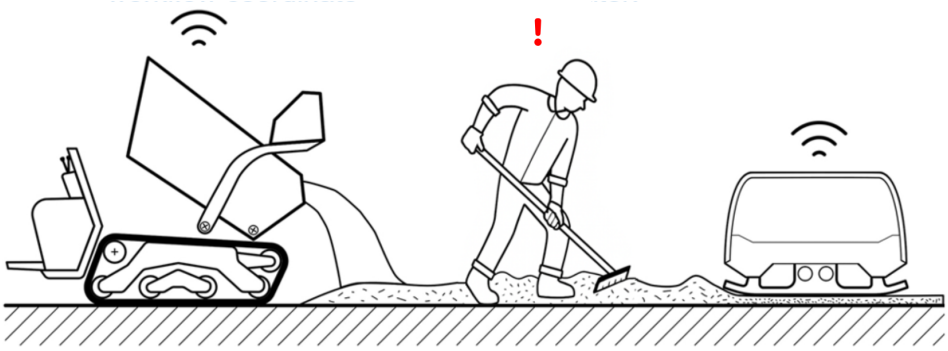
Requirement Analysis for Collaborative Robots in Construction Sites

Background

The adoption of mobile robots on construction sites is slow. This is not only due to rough, unstructured terrain, dynamically changing environments, or because human interference is challenging for robots to deal with. Regulations regarding the application of robots also limit their adoption. In our CoCoRo (Collaborative Construction Robots) project, we are developing a use case in which two autonomous construction vehicles work together with a human on a common task. An autonomous dumper loads, unloads, and transports bulk material, a human worker grades the material, and a compactor plate consolidates it. A server coordinates the tasks and the worker supervises. To better judge real-world applicability, we aim to formally define the necessary robot and system properties considering the specific task at hand and current regulations.



Tasks and Objectives

You will need to conduct a structured requirements analysis for mobile construction robots, focusing on the semi-automated bulk material transport and compaction use case. This encompasses robot properties (e.g. sensors, human-machine interface devices, and safety attributes), system capabilities (e.g. transparency, controllability, and efficiency), and applicable regulations (e.g. ISO 9241-110, ISO/TS 15066, and ISO 17757). Based on your literature review and industry norms you will define the scope, system-level requirements and functional requirements. However, rather than a fully detailed system requirements specification the outcome is a thesis with the following points;

- Formal definition of the use case
- Deriving functional requirements for components from the use case definition (e.g. Dumper should be able to localize the material pile)
- Summary of applicable regulations and norms
- Identification of pivotal requirements

Students looking for a master's thesis should be prepared to include the following points

- conduct a survey of construction companies identifying user demand (FML industry partners)
- produce a formal domain description of the use case (e.g., machines, materials, zones, relations, etc.)

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Research project:
CoCoRo

Type:
Bachelor / Semester Thesis / Master Thesis

Research area:
Requirement Analysis, Systems Engineering

Programming language:

Required skills:
Self motivated, Structured, Research Literacy

Language:
Englisch / German

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