Universität Stuttgart
Institut für Steuerungstechnik
der Werkzeugmaschinen und
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Masterarbeit
zu vergeben

Artificial Intelligence for Automated Functional Design

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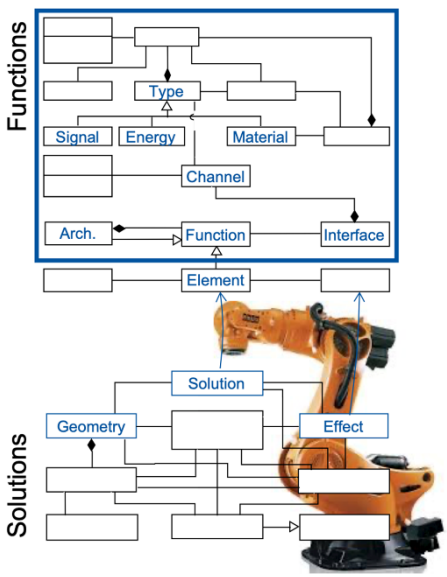
Background

Novel systems and devices are largely designed manually by following established guidelines and heuristics. Hence, the composition of these systems often follows geometric components, which makes realizing, tracing, and validating cross-cutting functions complicated. Research has produced methods for functional system design, in which system functions instead of system geometries are the central concern. To support these methods, dedicated guidelines and construction catalogues (Koller, Roth) exist. However, following these method manually is challenging and hinders their adoption.

Problem definition

Within the scope of this thesis, the processes and catalogues of selected functional system design methods shall be made accessible by devising an agent-based system that guides system designers using a combination of AI techniques (potentially LLMs or SLMs and ontologies).



Task

- Understand the concepts of functional system design as outlined by Koller and Roth
- Devise a method for making these concepts available for AI systems
- Develop an AI-assistant that supports system designers in creating and improving system designs
- Evaluate the assistant empirically

Requirements

- Ongoing studies in mechatronics, computer science, software engineering, or similar
- Interest in applying AI to engineering
- Basic understanding of AI and mechanical design
- Experience in object-oriented programming in Python
- Independent working style
- Passion for developing complex applications

Knowledge acquisition

- Functional systems design
- State-of-the-Art AI techniques
- Full-stack application development
- Methods of empirical evaluation
- Scientific writing

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