

# Automation of GUI Creation for Industrial Machines

## Graduate



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**Definition of Task:** Bühler AG aims to enhance its digital transformation by automating workflows and reducing manual effort in UI generation for machine operation. Currently, UI creation is a manual process, requiring engineers to assemble interfaces from product lifecycle management (PLM) data, configure visual elements individually, and ensure consistency across machine variants. This labour-intensive workflow leads to inefficiencies, design inconsistencies, and difficulties in maintaining and updating interfaces. Moreover, the lack of a standardized data-driven approach to visualization results in fragmented processes and redundant efforts across departments. As competitors introduce automated UI generation methods, Bühler AG faces the risk of falling behind in delivering efficient, scalable, and adaptable machine interfaces.

The objective of this thesis is to explore ways to automate the generation of process visualizations by leveraging existing machine configuration data. Specifically, the research investigates how variant management data, such as bills of materials (BOMs) and PLC variables, can be structured to reduce manual UI assembly and improve consistency. The goal is to establish a framework where UI elements are dynamically linked to structured data, ensuring scalability, automation, and usability across different machine variants.

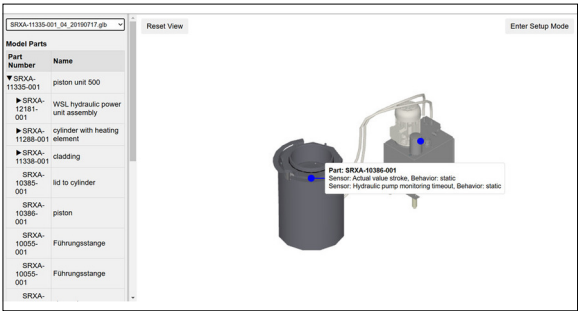
**Approach:** The research followed a design-oriented approach, combining conceptual development, stakeholder input, and prototype implementation. The process involved analysing existing workflows, defining requirements, and evaluating technical approaches for automating UI generation. A prototype was developed as a proof of concept, integrating 3D model visualization with a JSON-based mapping system to demonstrate how machine structures can be linked to PLC variables. The prototype was tested on an HMI touch panel, evaluating its feasibility within Bühler AG's existing infrastructure.

**Conclusion:** The prototype successfully demonstrated a structured approach to UI generation, reducing the need for fully manual creation of visualization elements while laying the groundwork for future PLC variable integration. Key achievements include bidirectional highlighting between 3D models and BOM entries, structured JSON exports for process mapping, and a dynamic UI setup mode for defining PLC variable placeholders. While actual PLC integration and permission handling was not yet implemented, the prototype provided a tangible step toward automation, receiving positive feedback from stakeholders.

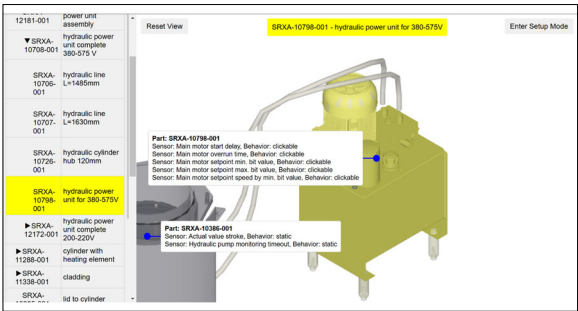
Further development could focus on developing PLC integration, improving permission management, and optimizing the mapping workflow to enhance usability.

Additionally, given the presence of a similar internal project with overlapping goals, collaborative efforts should be considered to leverage synergies and avoid redundant work. Integrating the solution concept into Bühler AG's existing process visualization GUI and exploiting data received from enterprise systems such as SAP or Windchill could help maximize its practical impact.

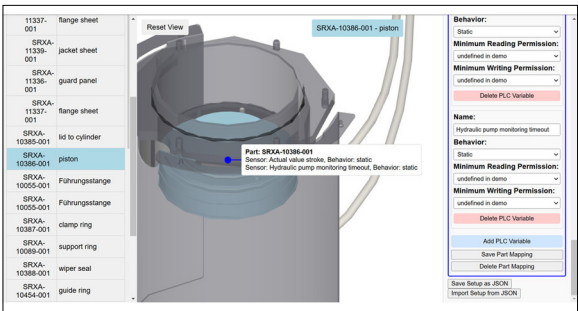
## Prototype Visualization of a Machine Own presentation



## Prototype Variable Mapping Flyouts Own presentation



## Prototype Variable Mapping Setup Own presentation



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## Subject Area

Business Engineering, Software and Systems, Mechatronics and Automation

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