Analyzing Variability in Automation Software with the Variability Analysis Toolkit

Abstract:
Control software for automated production systems (aPs) becomes increasingly complex as it evolves due to changing requirements. To address varying customer demands or altered regulatory guidelines, it is common practice to create a new system variant by copying and subsequently modifying existing control software. Referred to as clone-and-own, proper documentation is typically not cherished, thereby entailing severe maintenance issues in the long-run. To mitigate such problems and to reinstate sustainable development, respective software systems need to be compared and their variability information needs to be reverse-engineered. However, recent work identified variability management in the domain of aPs to remain a challenging endeavour and appropriate tool support to be missing. We bridge this gap and introduce the Variability Analysis Toolkit (VAT), an extensible platform that allows for the customizable definition of metrics to compare IEC61131-3 control software variants as well as providing means to visualize results. The VAT facilitates a working environment that allows for the exchange of produced results between users. By that, we aim to support engineers in re-engineering control software systems by providing them with means to define metrics based on their individual demands. We demonstrate the feasibility of the VAT using 24 software system variants implemented in accordance to the IEC61131-3 standard.