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Abstract

The industrial model-based design of production processes and corresponding control systems yields a large amount of design data with complex interdependencies, which makes it difficult to detect inconsistencies that may lead to design errors in an early stage of the overall design process. For different stages and parts of the design process, a variety of models in different formalisms is often used. The selected model formalisms restrict the choice of usable tools in each stage severely or require the new creation of a model in another formalism due to missing tool integration. Integrated model-based design promises to reduce the design effort significantly, and thus the cost, while improving the quality of the designed system by ensuring that errors are detected in an early stage, i.e. when it is relatively cheap to correct them. This dissertation illustrates a recently developed software support system for model-based integrated design of complex automated systems, using two challenging case studies, namely the model-based design of a miniature pipeless plant and the model-based design of the controller of a combustion engine carburetor. The inherent complexity of the case studies requires the features of the software support system, e.g. structured data and model management, algorithms for design consistency and design parameter propagation, and the integration of model-based tools by model transformations, to ensure an efficient and high-quality design process. The integration by model transformations is illustrated in detail for the connection of the modeling language *gPROMS* and the interchange format *CIF*. A selection of transformation tool chains exemplifies the benefit of model transformations. This thesis shows that tool supported model-based design, especially if aided by tool integration via model transformation, has beneficial effects on the efficiency and on the quality of the workflow.