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Autor(en) des Beitrags: Obermeier, Martin; Braun, Steven; Vogel-Heuser, Birgit

Titel des Beitrags: A Model Driven Approach on Object Oriented PLC Programming for Manufacturing Systems with regard to Usability

Abstract: This paper presents the modular automation for reuse in manufacturing systems (modAT4rMS) approach to support the model-driven engineering (MDE) of object oriented manufacturing automation software with regard to its usability and software modularity. With usability we refer to the aspects effectiveness, efficiency and user acceptance, as defined by ISO 9241-11. The modAT4rMS notations are based on selected features from the Unified Modeling Language (UML) and the Systems Modeling language (SysML) and iteratively further developed by a series of empirical studies with industrial practitioners as well as mechatronics trainees. With modAT4rMS a MDE approach for Programmable Logic Controller (PLC) programming was developed with the goal to facilitate modular object oriented programming of PLC software by improving the representation of the relationships between the structure and behavior diagram types and by reducing the level of abstraction in the structure model. modAT4rMS notations for PLC software structure and software behavior modeling are presented and illustrated with a modeling example using a modAT4rMS editor prototype. For the evaluation of the developed notations the results from a study with 168 participants is presented, showing the benefits of this new approach in comparison to the classic procedural paradigm (IEC 61131-3)
and the domain specific UML profile plcML in regard to programming performance and usability aspects. Finally the advantages and limitations of the approach are discussed and an outlook for further development is given.

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