Usability experiments to evaluate UML/SysML-based Model driven Software Engineering Notations for logic control in Manufacturing Automation

Abstract:

Many industrial companies and researchers are looking for more efficient model driven engineering approaches (MDE) in software engineering of manufacturing automation systems (MS) especially for logic control programming, but are uncertain about the applicability and effort needed to implement those approaches in comparison to classical Programmable Logic Controller (PLC) programming with IEC 61131-3. The paper summarizes results of usability experiments evaluating UML and SysML as software engineering notations for a MDE applied in the domain of manufacturing systems. Modeling MS needs to cover the domain specific characteristics, i.e. hybrid process, real time requirements and communication requirements. In addition the paper presents factors, constraint and practical experience for the development of further usability experiments. The paper gives examples of notational expressiveness and weaknesses of UML and SysML. The appendix delivers detailed master models, representing the correct best suited model, and evaluation schemes of the experiment, which is helpful if setting up own empirical experiments.