Dissertation title:

Integrated mechatronic engineering of specialized production

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Short Product Lifecycles and customized products force manufacturers to adapt their production systems faster and faster. Such adaptions offer chances of high cost reductions, particularly if thereby the process chain is optimized. This can be achieved through using customized machines. Especially in high-wage countries an increasing demand to specialized production machines can be noticed. Therefor machine builders are forced to engineer machines related to orders, which brings up a high amount of engineering-costs based on the total investment. It is obvious that the perspective of skilled worker shortage needs a highly efficient engineering to get short order throughput times. Certainly, the development of such machines is characterized by engineering sequentially within the disciplines of mechanics, electrics and automation. Beside further deficits insufficient definitions of requirements, low reuse of mechatronic modules respectively high efforts for definition of such modules and disconnected software-tools supporting the discipline specific tasks lead to unnecessary efforts along the project. Based on that, the goal of this thesis is to provide a seamless method for integrated mechatronic engineering of specialized production machines, parallelizing disciplines and reusing already developed mechatronic modules with nominal efforts. Thereto an analysis is done, getting the dependencies the disciplines have to each other and how mechatronic modules can be defined. This is the base for the presented method, starting with the definition of requirements, which is supported via a class list of characteristics. Afterwards, the requirements are broken down to components and modules within the phase of system design. This leads to a mechatronic machine concept. Within the next phase the different disciplines are working on the detailing in parallel. In conclusion a system-integration is done for validating the results. Supporting the different phases, available software-tools or specially built prototypes are used and integrated into a semantic net. The method and their software-assistance is validated based on a firmwareloading-machine. This shows the applicability and the benefits for the engineering of specialized production machines.