A Methodology to Manage the Transition from the Principle Solution towards the Controller Design of Advanced Mechatronic Systems

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Abstract

The products of mechanical engineering and related industrial sectors such as automotive industry rely on the close interaction of mechanics, electric/electronics, control engineering and software engineering. This is expressed by the term mechatronics. The variety of mechatronic systems ranges from the spatial integration of mechanics and electronics until the controlled movements of multi-body systems. The later is at the central point of this work.

The development of advanced mechatronic systems is a challenge. An important milestone is the principle solution which is the result of the conceptual design phase as well as the basis for the concretization of the system. Within the scope of this work, a methodology to manage the transition from the principle solution towards the controller design of advanced mechatronic systems has been developed. This methodology consists of two interrelated approaches. On the one hand is an approach to specify the basic control concepts within the domain-spanning principle solution of such systems. On the other hand is an approach to manage the extraction of information from the principle solution for the controller design of such systems.

Two demonstrators of the Collaborative Research Center 614 “Self-Optimizing Concepts and Structures in Mechanical Engineering” are selected to validate the methodology proposed in this work. The demonstrators consist of a self-optimizing motor drive and an autonomous railway convoy. As such, the aforementioned methodology is successfully validated.