A Computational Product Model for Conceptual Design Using SysML

Abstract:

The importance of the concept development phase in product development is contradictory to the level and amount of current computer-based support for it, especially with regards to mechanical design. Paper-based methods for conceptual design offer a far greater level of maturity and familiarity than current computational methods. Engineers usually work with software designed to address only a single stage of the concept design phase, such as requirements management tools. Integration with software covering other stages, e.g. functional modeling, is generally poor. Using the requirements for concept models outlined in the VDI 2221 guideline for systematic product development as a starting point, the authors propose an integrated product model constructed using the Systems Modeling Language (SysML) that moves beyond geometry to integrate all necessary aspects for conceptual design. These include requirements, functions and function structures, working principles and their structures as well as physical effects. In order to explore the applicability of SysML for mechanical design, a case study on the design of a passenger car’s luggage compartment cover is presented. The case study shows that many different SysML diagram types are suitable for formal modeling in mechanical concept.
design, though they were originally defined for software and control system development. It is then proposed that the creation and use of libraries defining generic as well as more complicated templates raises efficiency in modeling. The use of diagrams and their semantics for conceptual modeling make SysML a strong candidate for integrated product modeling of mechanical as well as mechatronic systems.

Stichworte: Integrated Product Model; Conceptual Design; Formal Modeling Language; SysML

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