A MORE ACCURATE SYSTEMS MODELLING AND SIMULATION FRAMEWORK IN DESIGN AND OPTIMIZATION OF A SYSTEM DURING THE CONCEPTUAL PHASE

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Abstract

Modelling and simulation of complex mechanical systems involving multi-simulation environment, with great accuracy is essential as part of the conceptual design phase of a system under design. The co-simulation between system level model with various subsystems based on Model Based Design (MBD) and component level model is a perfect example. These mathematical models have distinct features such as the type of differential equations used to represent its physics, boundary conditions etc. In this study we use MBD methodology to develop a simulation model that can drive product development and optimization of mechanical systems. We also incorporate a 3-D Computational Fluid Dynamics (CFD) model as one of its subsystem into the System Level (SL) model architecture. This is done by creating a co-simulation interface between these two different modelling environments and exchange boundary conditions via a specific interface. The interaction between multi-domain models through system simulation together with the detailed fluid flow and thermal analysis of the component through CFD is finally explained. Finally, the dynamic behaviour of the complete system and its temporal and spatial scales is shown to be captured in more detail.

Keywords: Co-simulation, System Simulation, CFD