DSD Keynote "The modeling and design paradoxical"

Wolfgang Ecker – Infineon Technologies/TU Munich
Wolfgang.Ecker@Infineon.com / wolfgang.Ecker@tum.de

Abstract
A model realizes two contradictory goals. On the one hand it is an abstraction of reality capturing relevant aspects of an entity, like an outline of a scientific paper, the sketch of clothing for a fashion model or the functionality of a subsystem. On the other hand, a model is essential in the exploration of different solutions comparing models or systems of models as well as a starting point of the design process. As a result, it has to contain detailed information to allow for a fair comparison and for the design process to be smooth, efficient and exhaustive. The design process in particular can either be manual manufacturing for instance clothing or automatic like the synthesis of a hardware description level model. The conflict of capturing all but only vital information for comparison and creation is a common problem not only in engineering and science.

In fashion for example, models migrated from the person presenting clothes to trendsetting idols. This shift of focus is said to be partially responsible for the incline of anorexia in society. Another model to compare relevance of scientists is used in academia. Hereby the amount of authored or co-authored papers is used as a model to differentiate. The downside of this model is that it does not factor in quality or uniqueness. As a result, in order to increase the amount of published papers AI applications are used to re-write an existing paper so that a similar idea can be published in different conferences without being recognized by plagiarism checkers. Technologies like the currently intensely discussed ChatGPT introduce even more possibilities.

The statistician George Box's dry comment "All models are wrong" captures the essence of the outlined conflict. The quote might have been directed more to the danger of incompleteness found in statistical models derived from an insufficient dataset. However, with ongoing automatic derivation of designs from models, the threat goes beyond analysis and reaches implementation.

George Box added to his dry comment with a wink "Some Are Useful". This quote understates the vital necessity of models in engineering where for instance billions of transistors have to be placed in a chip. The paradox depicted by both comments of using wrong yet necessary models and the balancing act of including all relevant data can be relieved by following two simple rules: First, be aware that a model – and also a program by the way - is an abstraction, i.e. details are missing. Therefore, models may be valid only in some circumstances. Second, automating the design process based on models requires the awareness of the ground truth in a model, the specifics of the execution semantic of the modeling language as well as the functionality and thus required additional information of the applied tools.