Uncertainty quantification for power electronic and analog circuitry in Industry

Proposal for a Bachelor’s thesis | Master’s thesis
Study field: Computational Engineering | Electrical Engineering | Mathematics

Description
The company Signify (former Philips Lighting) in Eindhoven is the world leader in lighting products. Their products are designed and optimized by computer aided design workflows including uncertainty quantification (UQ). UQ is a technique for example used to analyze the impact of manufacturing imperfections on the products. Nowadays, companies aim for six sigma processes, i.e. the variation is assumed to be normally distributed and > 99% of all outcomes shall be free of defects.

This thesis shall analyze, investigate and implement methods for UQ of power electronic and analog circuitry at Signify. This requires to understand the existing simulation workflow at Signify and the (random) influences that may lead to defects. Based on this understanding UQ methods, e.g. (quasi) Monte Carlo, surrogate-based Monte Carlo or polynomial chaos techniques, can be selected and possibly extended if necessary. Finally, an uncertainty quantification workflow shall be established, e.g. by writing code and user interfaces.

Work plan
- Familiarization with Uncertainty Quantification, e.g., [2] and software environments implementing those methods, e.g. DAKOTA [1]. This will be supervised by TU Darmstadt.
- Familiarization with the simulation workflow at Signify, investigation which methods are well suited and implementation of the necessary code and user interfaces. This will be supervised externally at Signify.

Prerequisites
Interest in numerical methods, basic knowledge of stochastics and circuit simulation.

References

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Figure 2: Hue Connect board from Signify (image source: https://hueblog.de)