

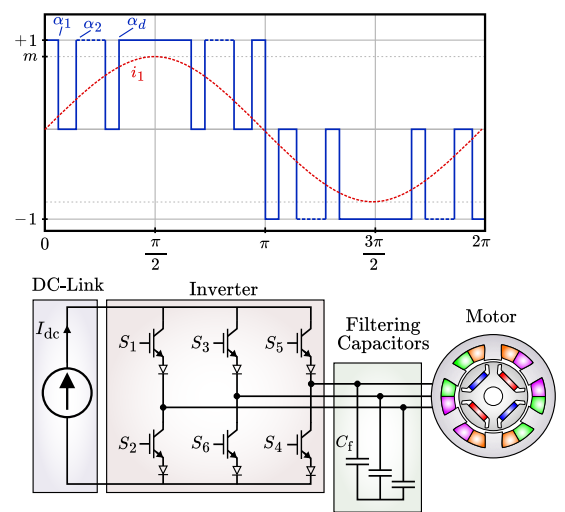
Master's Thesis

Synchronous Modulation of Current Source Inverters applied to PMSM Drives



MOTIVATION

Permanent magnet synchronous motors (PMSMs) are widely used in automotive and industrial applications mainly because they offer high power density and high efficiency while keeping a compact design. Nonetheless, the existing power losses are substantially influenced by the harmonic current distortion, which is mainly caused by the switching nature of the drive's converter. Current source converters (CSCs) is a promising alternative to mitigate these effects, potentially boosting overall energy efficiency. Additionally, advanced synchronous modulation techniques—such as Selective Harmonic Elimination (SHE) and Optimized Pulse Patterns (OPP)—can further enhance performance and reliability. By systematically examining and comparing the CSC-based approaches and the different modulation techniques with the current state-of-the-art on voltage source converter (VSC) based drives, it will be possible to identify the most advantageous topology–modulation combination in terms of energy efficiency.



RESEARCH TOPICS and TASKS

- Identification of the analytical model of a CSC-based PMSM drive.
- Simulation of different synchronous modulation techniques such as SHE and OPP.
- Analysis and comparison of the different performance of the drive if the CSC is replaced with a VSC.
- Review of different synchronous modulation methods applied for various types of converters.
- Detailed project description upon discussion with the candidate.

ORGANISATIONAL MATTERS

- 🕒 Start: Immediately
- 🏢 Workplaces and lab-spaces the institute available
- 👥 Support from the motivated teams of the institute
- 💬 Writing in German or English possible

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