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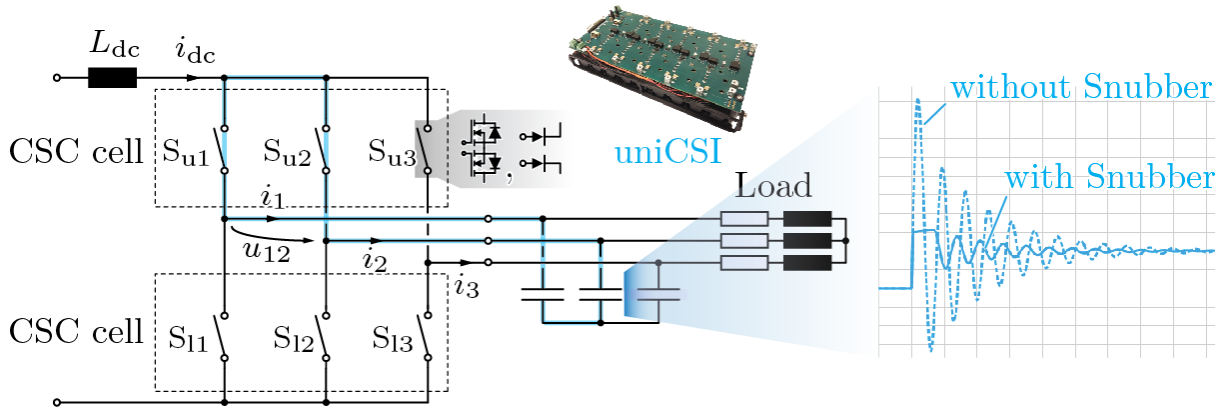
Bachelor Thesis @InstitutFürMechatronik

Design and Implementation of a Snubber Circuit for High-di/dt Current Source Converters



Background: Modern drive systems increasingly employ wide-bandgap semiconductors, enabling very fast switching transients. As a result, issues caused by high dv/dt and di/dt become critical. This project focuses on the design of a novel snubber circuit tailored for current source converters, aiming to suppress overvoltage and enable current control with high di/dt demands that were previously difficult to achieve.

Objectives: Analyze overvoltage phenomena in current source inverters. Design a snubber circuit optimized for both low losses and effective surge absorption. Implement high-di/dt current control and compare voltage overshoot and efficiency with and without the snubber circuit.

Approach: The project starts with an analytical investigation of snubber operation based on circuit theory. Next, the snubber parameters will be designed using PLECS, a time-domain circuit simulation tool for power electronics. A practical circuit structure will then be developed to be attached to an existing converter, followed by PCB design using KiCad. Finally, current control will be implemented on a microcontroller, and the performance of the snubber circuit will be experimentally validated. All necessary hardware will be provided.

Tools/Software: C, Matlab, PLECS, KiCad

Prerequisites: Basic knowledge of power electronics is helpful, but no specific prerequisites are required.

Application and Supervision:

Dr. Takanobu Ohno
takanobu.ohno@uibk.ac.at