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## Large signal modeling and control of two and three level DC-DC converters based on Takagi-Sugeno fuzzy approach

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The design and the implementation of a TS fuzzy modeling and control applied to two level and three level DC-DC converters that operate in large-signal domain are presented. Unlike conventional fuzzy controller design which addresses only small-signal system control, the proposed approach ensures good performances and high accuracy of the modeling and control system over the whole operating space. This links to: i) The ability of dealing with the nonlinearity present in the conversion ratio of the DC-DC converters by means of a Takagi-Sugeno fuzzy approximator; ii) The skill to automatically derive the corresponding small-signal model for the converters under a wide range of operating conditions using TS fuzzy modeling approach. According to the TS fuzzy technique, the proposed control techniques vary from self-tuning PI control to the state-feedback based control using Parallel Distributed Compensation (PDC) concept. Experimental results using dSPACE DS1104 board, two level and three level DC-DC converters, for different operating conditions, illustrate the efficiency, the robustness and the flexibility of the proposed approach.

### Biography

Said El Beid received the BIng and Master's degree in Electrical and Electronic Engineering (with honors) from Hassan II University, Morocco and the PhD degree in Electrical Engineering (with honors) from Cadi Ayyad University, Morocco. He is currently an Assistant Professor of Electrical Engineering at Chouaib-Doukkali University, Morocco where he is a Member of the Laboratory of Engineering Sciences for Energy since 2015 and he is a Member of the Laboratory of Electrical Systems and Telecommunications in Cadi Ayyad University since 2007. He is also an IEEE member since 2007 and a member of the reviewing committee of IEEE Transactions on Power Electronics, *IEEE Transactions on Industrial Electronics*, *Frontiers of Information Technology & Electronic Engineering* journal and *Universal Journal of Control and Automation*. He has participated in several national and international research projects. He has published several papers in reputed international journals and international conferences. His main areas of research interest are power electronics, switching-mode power supplies, modeling and control of DC-DC converters and multilevel converters, and nonlinear systems.

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