Analysis and Synthesis of Discontinuous Systems for Control of Power Converters.

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Abstract. ON-OFF is the only admissible operation mode for power converters, therefore sliding mode is an appropriate tool to control their currents and voltages, since this methodology implies discontinuous control actions. Sliding mode control algorithms for DC/DC, DC/AC and AC/DC power converters are surveyed in the presentation. Current and voltage controls are demonstrated for buck and bust DC/DC converters. It is shown, that direct voltage control for a boost converter results in unstable zero dynamics. Chattering suppression based on harmonic cancellation principle along with switching frequency control is demonstrated. Additional degree of freedom in a DC/AC converter is utilized for minimization of switching frequency and as a result heat losses. Zero reactive power and elimination of higher harmonics in AC/DC power converters is reached by enforcing multidimensional sliding modes.

Key words: power converter, sliding mode control, chattering, harmonic cancellation.