Nonlinear Analysis and Chaos Control of an Interleaved Parallel Boost Converter

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Abstract:

Switching converters inherently exhibit nonlinear behavior and high-frequency switching. Parameter selection and signal disturbances can affect their stability and may prevent normal operation. In this paper, a state-space model of an interleaved parallel Boost converter is established using nonlinear dynamics analysis. Discrete iteration is performed according to its operating modes to investigate bifurcation and chaotic behavior resulting from variations in converter parameters. Based on the concept of time-delayed feedback control for chaos suppression, a proportional delayed-feedback coefficient is obtained through discrete iteration. Comparisons of the bifurcation characteristics and time-domain outputs before and after control show that proportional time-delayed feedback can effectively suppress chaos in the interleaved parallel Boost circuit. This analysis provides a basis for converter parameter selection and improves circuit stability.

Keywords:

Interleaved parallel Boost converter, discrete iteration, nonlinear analysis, chaos control.