ABSTRACT

EFFECT OF SYSTEM NONLINEARITIES ON SLIDING MODE CONTROL DESIGN FOR BUCK CONVERTERS

The objective of this thesis is to present the results of a study of the effect of inherent nonlinearities on the Sliding Mode Control (SMC) scheme of step-down (buck) DC-DC converters. Much research has been reported in the literature to analyze the converters, which exhibit distinct modes of operation. Most of the emphasis has been on the continuous conduction mode, and not on control methods in the discontinuous conduction mode, where nonlinear characteristics are dominant.

In this thesis, a nonlinear model has been developed and used to introduce a novel SMC scheme for the buck converter in the discontinuous conduction mode. The main task of the new problem formulation is to make the controller robust to changes caused by operating conditions. A comparison of the results with the PID control scheme is made. It is demonstrated that the SMC is more robust for load changes and parameter variations than PID.

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