PI-PBC Approach for Voltage Regulation in Ćuk Converters with Adaptive Load Estimation

Abstract

This paper proposes a proportional-integral passivity-based controller (PI-PBC) for supporting voltage in linear loads integrated with Ćuk converters. An adaptive load estimator is also employed to avoid current measurements at the load point. This estimator permits an on-line estimation of the load conductance for maintaining the output voltage as constant as possible independent of its variations. The proposed PI-PBC allows guaranteeing stability conditions in Lyapunov's sense for a closed-loop operation by exploiting the port-Hamiltonian structure of the Ćuk converter model. Numerical simulations evidence the advantages of using PI actions for PBC designs compared with the classical interconnection and damping (IDA-PBC) approach. All numerical simulations are conducted via MATLAB/Simulink software.