Non-Intrusive Parameter Estimation for Single-Phase Induction Motor Using Transient Data

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Abstract
Single-phase induction motors (SPIMs) have been widely used in residential applications such as pumps, washers, dryers, and so on. The stall of this type of motor is attributed to the root cause of fault-induced delayed voltage recovery (FIDVR) phenomenon, which has increasingly challenged the distribution grid. To study and mitigate the effect of FIDVR, a more precise SPIM model is desired. A non-intrusive method to estimate the parameters are of interest because most SPIMs had been already installed and hence it is impractical to take them offline to identify the parameters. This talk presents the parameter estimation problem for SPIM using start-up transient voltage and current measurements available at the motor terminals. The non-intrusive estimation approach relies on augmented state-space representation of the motor dynamics and Extended Kalman Filtering. The effectiveness of this approach is illustrated by the simulation using a SPIM model with realistic parameters.

Split-Phase Control: Achieving Complete Soft-Charging Operation of a Dickson Switched-Capacitor Converter

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Abstract
Switched-capacitor (SC) converters are gaining popularity due to their high power density and suitability for on-chip integration. Soft-charging and resonant techniques can be used to eliminate the current transient during the switching instances, and improve the power density and efficiency of SC converters. In this work, we propose a split-phase control scheme that enables the Dickson converter to achieve complete soft-charging (or resonant) operation, which is not possible using the conventional two-phase control. An analytical method is extended to help in the analysis and design of split-phase controlled Dickson converters. The proposed technique and analysis are verified by both simulation and experimental results. An 8-to-1 step-down Dickson converter with an input voltage of 150-V and rated power of 36 W is built using GaN FETs. The converter prototype demonstrated a five fold reduction in the output impedance (which corresponds to conduction power loss) compared to a conventional Dickson converter, as a result of the split-phase controlled soft-charging operation.