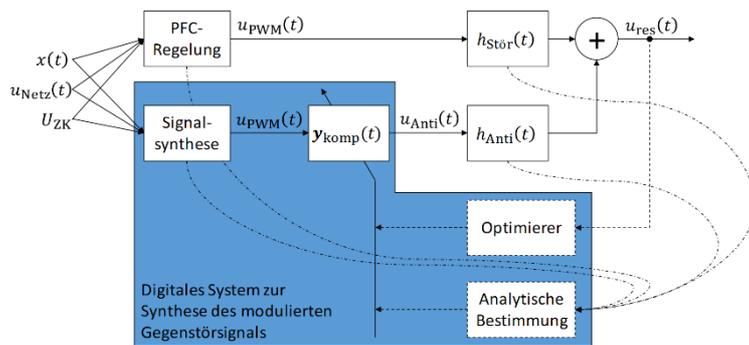


Digital Power Factor Correction

Reducing electromagnetic interference emissions in PFCs

Invention

In the case of mains-powered devices such as computer power supplies, it is necessary to regulate the current draw from the supply mains. This is done by means of power factor correction (PFC). The Problem: Significant reactive and distortion power or spurious emissions can occur, which



Block diagram for a digital and active interference signal suppression using synthesized and modulated counter interference signals

interfere with devices in the vicinity such as radios or routers. Usually these spurious emissions are limited by passive filters and shielding enclosures, but these are expensive and heavy. In this invention, spurious emissions are selectively reduced by modulated counter-interference signals. A counter-interference synthesizer generates the counter-interference signal from synthesized and modulated sinusoidal signals whose amplitude and phase are calculated using the Fourier transform. The changing duty cycle of the PFC is also taken into account. The counter-interference signal is coupled into the overall system via an injector. Depending on the method and algorithm, a digital signal processing hardware, e.g. an FPGA, DSP, microcontroller or specially designed ASICs, can predict the electromagnetic interference and control the counter-interference synthesizer in an optimized way accordingly.

Commercial Opportunities

By using the new digital power factor correction, the electromagnetic interference in power electronic systems such as battery chargers, plug-in power supplies, computer power supplies or e-bike chargers can be significantly reduced. Likewise, the hardware expenditure for passive filters or shielding housings can be reduced.

Current Status

An application at the German Patent and Trademark Office has been filed on 6.9.2021, further foreign subsequent applications are possible in the priority year. A prototype has been created that demonstrates the functional capability of the invention. On behalf of the Technical University of Dortmund, we offer interested companies the possibility of licensing and joint further development of the technology with the inventors from the TU Dortmund.

Relevant Publications

Bendicks, A.; Peters, A.; Frei, S.: FPGA-based Active Cancellation of the EMI of a Boost Power Factor Correction (PFC) by Injecting Modulated Sine Waves, IEEE Letters on Electromagnetic Compatibility Practice and Applications, 2020.

Bendicks, A.; Gerten, M.; Frei, S.: Active Cancellation of Periodic DM EMI at the Input of a GaN Motor Inverter by Injecting Synthesized and Synchronized Signals, EMC Europe 2020.

An invention of TU Dortmund University.

Competitive Advantages

- digital power factor correction
- broadband interference suppression
- weight reduction
- cost-effective
- variable

Technology Readiness Level

123456789

Technology validated in lab

Industries

- Electronics
- Charger manufacturer

Ref. No.

6129

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