Pareto-based modulated model predictive control strategy for power converter applications

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Modulated model predictive control (M 2 PC) allows fixed switching frequency operation of power converters, producing lower ripple and lower total harmonic distortion (THD) in the output signals than those obtained using regular model predictive control (MPC) algorithms. However, the design of the M 2 PC algorithm and its performance depend on, among other factors, the tuning of weighting factors, which are required by the cost functions typically used in predictive control algorithms. In this paper, a novel Pareto-based multi-objective M 2 PC (MO-M 2 PC) strategy is proposed. In this case, the use of weighting factors is not required, and the optimization problem is solved using a multi-objective approach. The aim of the proposed MO-M 2 PC strategy is to consider practical rules, such as satisfaction of soft constraints, to calculate the control actions. The proposed Pareto-based MO-M 2 PC strategy can be applied to any power converter topology. In this paper, exp