

Statistical tools to evaluate the performance of current control strategies of power converters and drives

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Abstract

The proposal of new current control techniques for power converters and electric motor drives has been one of the main research topics in the fields of power converters and drives during the past years. Usually, when evaluating and comparing the performance of current controllers, various figures of merit (FMs) are used, e.g., the mean squared error or the absolute error between the reference and the measurement. Here, it is shown that such FMs have a random nature. Nevertheless, only one result is reported in many published articles, for each FMs. Also, it is not indicated whether or not more than one trial has been performed to obtain the FM. In that case, opposite conclusions can be reached when two current controllers are compared, depending on the chosen results. In this sense, the number, n , of experimental runs required to accurately compare any FM, is proposed in order to address this problem. Likewise, a statistical comparison procedure is introduced to evaluate the relative performance of two controllers using any FM. Also, based on the proposed statistical comparison methodology compared to other criteria, an exhaustive simulation analysis is presented comparing the accuracy of decision-making. Finally, a real data set application based on experimental results is used to illustrate the proposed procedure.