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Identification of Switched Reluctance Motor Parameters Using Exponential Swept-Sine Signal

Authors : Abdelmalek Ouannou, Adil Brouri, Laila Kadi, Tarik

Abstract : Switched reluctance motor (SRM) has a major interest in a large domain as in electric vehicle driving because of its wide range of speed operation, high performances, low cost, and robustness to run under degraded conditions. The purpose of the paper is to develop a new analytical approach for modeling SRM parameters. Then, an identification scheme is proposed to obtain the SRM parameters. Since the SRM is featured by a highly nonlinear behavior, modeling these devices is difficult. Then, it is convenient to develop an accurate model describing the SRM. Furthermore, it is always operated in the magnetically saturated mode to maximize the energy transfer. Accordingly, it is shown that the SRM can be accurately described by a generalized polynomial Hammerstein model, i.e., the parallel connection of several Hammerstein models having polynomial nonlinearity. Presently an analytical identification method is developed using a chirp excitation signal. Afterward, the parameters of the obtained model have been determined using Finite Element Method analysis. Finally, in order to show the effectiveness of the proposed method, a comparison between the true and estimate models has been performed. The obtained results show that the output responses are very close.

Keywords : switched reluctance motor, swept-sine signal, generalized Hammerstein model, nonlinear system
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