Frequency Response Estimation Method for Modelica Model and Frequency Estimation Toolbox Implementation

Bingrui Bao[1]   Junfeng Guo[1]   Baokun Zhang[1]   Fanli Zhou[1]

[1] Suzhou Tongyuan Software&Control Tech. Co., Ltd. China, {baobr,guojf,zhangbk,zhoufl}@tongyuan.cc

Abstract

The frequency-response method is widely used because of its convenience and applicability in the control system analysis and design, and the premise of the design based on this method is to obtain the frequency response of the system. Aiming at the problem that the strong nonlinearity is difficult to be linearized in practical engineering systems, this paper presents a method for estimating the frequency response based on the time domain simulation data of Modelica models. The spectrum of the appropriate IO data at the steady-state operating point of the system is analyzed by Fourier transform, and then converted into the frequency response of the system. The proposed method is applicable to the multi-domain Modelica model, FMU, and the black box model. A frequency response estimation toolbox is implemented and integrated into the MWorks platform based on this method, which provides important support for the control design for Modelica model. Simulation examples illustrated the validity of the proposed method and the toolbox.

Keywords: Strongly nonlinear system, Frequency response estimation, Toolbox