Evaluation of non-parametric identification techniques in second order models plus dead time

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Abstract

In this paper, a set of non-parametric identification techniques are used in order to obtain second order models plus dead time for an underdamped system. Initially, non-parametric techniques were used to identify the system from the temperature data of a coal-heated oven. In this case, the identification techniques proposed by Stark, Jahanmiri-Fallahi and Ogata were used, which require obtaining two or three points of the step response for the system under study. In addition, the Matlab PID Tuner app was used to identify the underdamped system and compare the results with the other methods. The results show that the PID Tuner and the method proposed by Ogata are the ones that best represent the dynamics of the underdamped system, taking into account the values for the integral absolute error (IAE) and the correlation coefficient. With the Stark method an IAE of 181.56 was obtained, while with the PID Tuner the best performance was achieved with an IAE of 21.59. In terms of the results obtained with the cross correlation, the best performance was achieved with the PID tuner and the Stark method. Copyright © 2020 Institute of Advanced Engineering and Science. All rights reserved.

Keywords

Matlab PID tuner; Non-parametric techniques; System identification; Underdamped system