Improved Frequency Response Model Identification Method for automatic tuning of PID controllers

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For the automatic tuning of PID controllers, a new identification algorithm is proposed to identify more accurate frequency data sets of the process. The proposed method uses a new transform modified from the Fourier transform. It guarantees better accuracy and can provide much more frequency data sets of the process than the previous describing function analysis algorithm. Moreover, in comparison with the previous identification methods to estimate frequency data sets, the proposed method has a wider range of application to incorporate more various situations of the process. The application of the previous methods is restricted to the process of several specific conditions. They can be only applied to the case that the process is initially in steady state and the initial process input and output are zero. However, the proposed identification method can successfully estimate exact frequency responses for the case that the initial process input and output are not zero in cyclic steady state. The proposed method not only provides exact data sets for all desired frequencies but also shows an acceptable robustness to measurement noises and disturbances.