Pole-placement Predictive Functional Control for under-damped systems with real numbers algebra

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Abstract

This paper presents the new algorithm of PP-PFC (Pole-placement Predictive Functional Control) for stable, linear under-damped higher-order processes. It is shown that while conventional PFC aims to get first-order exponential behavior, this is not always straightforward with significant under-damped modes and hence a pole-placement PFC algorithm is proposed which can be tuned more precisely to achieve the desired dynamics, but exploits complex number algebra and linear combinations in order to deliver guarantees of stability and performance. Nevertheless, practical implementation is easier by avoiding complex number algebra and hence a modified formulation of the PP-PFC algorithm is also presented which utilises just real numbers while retaining the key attributes of simple algebra, coding and tuning. The potential advantages are demonstrated with numerical examples and real-time control of a laboratory plant. (C) 2017 ISA. Published by Elsevier Ltd. All rights reserved.

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