Improving Intersample Performance with Linearly Parameterized Feedforward using Sampled-Data Differentiator

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Abstract: Increasing performance requirements result in demanding intersample performance improvement in industrial motion systems while there is a limitation of sampling time. The aim of this study is to improve intersample performance by using a discrete-time linearly parameterized feedforward while maintaining on-sample performance in high-precision mechatronic systems. The developed approach is parameterized with a sampled-data differentiator using single-rate and multirate inversion. The resulting framework improves both on-sample and intersample behavior compared to using a conventional backward differentiator. The performance improvement is demonstrated in a benchmark motion system.

Keywords: feedforward, discrete-time system, sampled-data control, zero-order-hold, multirate