

Asymptotic Tracking Performance Of Sampled-Data Systems

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Summary

This paper studies the tracking performance of sampled-data control systems. We consider the problem of tracking a step reference input by a sampled-data controller, and the goal is to minimize the integral square of the error between the output and input signals. Under this criterion, of particular interest is to investigate whether and when a degradation in the tracking performance may result, due to the use of sampled-data controllers, and whether such a degradation, where it does exist, can be remedied by a sufficiently fast sampler. The degradation thus constitutes a gap between the optimal performance achievable by continuous-time controllers and that by optimal sampled-data controllers. It is shown that for plants with relative degree greater than one, a performance loss does take place and it can never be recovered despite that the sampler is allowed to operate arbitrarily fast. This performance loss is seen to be fundamental of the sampling and hold mechanism, rather than from the plant itself. It is also shown that for plants with relative degree one, the loss can indeed be retrieved with a sufficiently fast sampler.

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