Limitations On Maximal Tracking Accuracy  
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Summary

This paper studies optimal tracking performance issues pertaining to finite-dimensional, linear, time-invariant feedback control systems. The problem under consideration amounts to determining the minimal tracking error between the output slid reference signals of a feedback system, attainable by all possible stabilizing compensators. An integral square error criterion is used as a measure for the tracking error, and explicit expressions are derived for this minimal tracking error with respect to step reference signals. It is shown that plant nonminimum phase zeros have a negative effect on a feedback system's ability to reduce the tracking error, and that in a multivariable system this effect results in a way depending on not only the zero locations, but also the zero directions. It is also shown that if unity feedback structure is used for tracking purposes, plant nonminimum phase zeros and unstable poles can together play a particularly detrimental role in the achievable tracking performance, especially when the zeros and poles are nearby and their directions are closely aligned. On the other hand, if a two-parameter controller structure is used, the achievable tracking performance depends only on the plant nonminimum phase zeros.

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