Observer-based control of an overhead crane

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Abstract

Swift and precise load position control is an unavoidable task for an overhead crane operating in crowded environments. In particular, load oscillations must be avoided due to safety considerations. One of the main obstacles to accomplish these goals is the fact that the position of the load or, more precisely, the angle that the rope forms with respect to a vertical line is in general unknown. The goal of this paper is twofold. First, the dynamic state feedback linearization property is exploited in order to achieve asymptotic output tracking when the full state is available for measurement. Second, in the more realistic situation when the load position cannot be directly measured, three different reduced order observers are used in order to estimate the actual value. These are: a linear observer based on the first order approximation, a (nonlinear) numerical observer, and a high gain observer. Simulation results serve to compare the performance of the three proposed schemes.