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High Performance Control for Relative Degree One and Relative Degree Two Systems

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Propositions

1. The control system presented in Chapter 3 is capable of achieving tracking control of the piezoelectric stack actuator.
2. Ratio-based funnel controllers designed in Chapter 4 can avoid certain backdraws of traditional funnel controllers: i) Ratio-based funnel controllers can deliver asymptotic tracking while all relevant signals remain bounded. ii) Ratio-based funnel controllers can tolerate the tracking error crossing the specified funnel region. iii) Ratio-based funnel controllers can restrain the derivative of the tracking error to some extent.
3. Error derivative limiting (EDL) funnel controllers designed in Chapter 5 can improve the control performance for relative degree one systems by tuning the error derivative in terms of the tracking error and the prescribed funnel boundary.
4. EDL funnel controllers for relative degree one systems can accomplish asymptotic tracking, and allow the error to cross the funnel boundary by some minor adjustments.
5. EDL funnel controllers for relative degree two systems designed in Chapter 6 can improve the control performance by reducing the value of an evaluation function.
6. EDL funnel controllers for relative degree two systems can be used for the control of the piezoelectric stack actuator. The designed funnel controller requires no accurate identification, and can ensure the transient behavior of the closed loop.