

ABSTRACT

TEIXEIRA, Aline Freixo. *Uncertain Systems Tracking with Unknown Control Direction via ADRC Method and Monitoring Function*. 57 f. Dissertação (Mestrado em Engenharia Eletrônica) - Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, 2021.

This paper proposes an improved active disturbance rejection control (ADRC) method for output tracking of uncertain plants with unknown control direction. A basic design procedure in the ADRC methodology is to assume the exact knowledge of the system control direction, that is, the sign of its input channel coefficient. Recent works have been proposed to relax such a requirement by performing modifications in its control structure. However, despite considering uncertainties in the input coefficient, many variants of the ADRC method still assume the knowledge of the control direction, which means that the control gain is uncertain in norm, but not in sign. For solving the latter case, and also aiming to generalize the earlier ADRC results for a larger class of systems, the present work incorporates the concept of monitoring functions in the controller design, which is a switching-based strategy whose main function is to determine the correct sign of the control direction, which is directly related to the sign of the plant input channel coefficient. As a consequence of the resulting new control method, exponential stability with respect to a small residual set is guaranteed for the output tracking problem in closed-loop. Numerical simulations are performed and discussed in an academical example for comparing the robustness properties concerning the unknown control direction of the proposed strategy with another ADRC methodology. In the sequence, the proposed ADRC strategy based on monitoring function is applied to the automotive plant system of an Anti-Lock Braking System (ABS) for illustrating its performance.

Keywords: Uncertain Systems. ADRC. Robust Control. Monitoring Function. Unknown Control Directions. ABS.