

Analysis of transient-state stability of a sliding-mode speed observer

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Abstract: A recent development of an adaptive sliding-mode speed observer ensures stability in the Lyapunov sense under steady-state operation. To assess its stability during transient state is vital for a practical observer. Based on the Lyapunov's direct method, one possible analysis is to determine two important solutions corresponding to a quadratic inequality concerning angular acceleration of the rotor. As a consequence, the theorem of LaSalle's invariant set has been applied to explain stability scenario since prior ending of transient state up to steady state. During transient state, the time derivative of Lyapunov function (V) may be either positive or negative. This means that the observer may become momentarily unstable because mechanical dynamics could prominently appear in V . The paper presents detailed analysis together with simulation results.

Ei controlled terms: Induction motors - Rotors - Lyapunov methods - Convergence of numerical methods - Computer simulation