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SYNTHESIS OF SUBOPTIMAL COMPENSATORS OF DISTURBANCES IN FORM OF OBSERVER OF EXTENDED STATE VECTOR

The purpose of this paper is to synthesize disturbance compensators in the form of an extended state-vector observer, taking into account the chosen optimality criterion and restrictions to provide given quality indices for transient processes. New procedures for synthesis of disturbance compensators, which are suboptimal according to minimum-rate criteria H_2 or H_∞, are proposed considering restrictions on locations of poles of the transfer function of a closed system for the required quality indices of transient processes of the observer. This approach allows a necessary accuracy of the disturbance estimation with noise of sensors. The problem for finding a suboptimal observer is solved using the methodology of optimization for H_2 and H_∞ and a technique of linear matrix inequalities. Investigations of the synthesized compensators in time and frequency domains are carried out to illustrate special features and the efficiency of the procedures proposed. The results of the paper can be used in practice for solving control problems under conditions of uncertainty and significant sensor noise, using the two-loop approach. According to this approach an outer loop (controller) realizes the stabilization criterion and an internal loop (compensator) provides a criterion for compensation or reduction of the effect of disturbances.

Keywords: disturbances compensator, extended state vector, observer, normal transfer function, disturbance, linear matrix inequalities, restrictions on location of poles, singular numbers .

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