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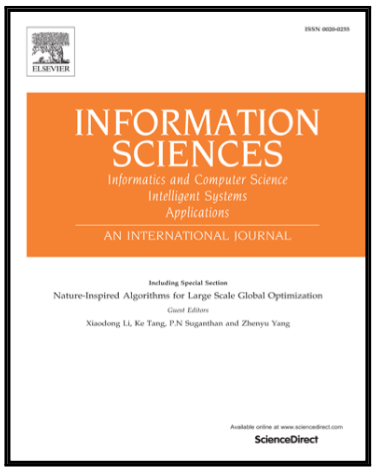

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Construction of hybrid interval observers for switched linear systems☆

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Abstract

This paper investigates the design of hybrid interval observers (IOs) of switched linear systems involving additive disturbances, whose subsystems need not to be cooperative. We first propose the definition of IOs for switched systems and extend the coordinate transformation for non-switched linear systems into switched ones. Based on the switched coordinate transformation, the considered switched linear system is converted into a hybrid cooperative system, whose states jump at each switching times. Then, by using the multiple Lyapunov functions method, IOs for switched linear systems are designed in two cases, that is, all of the subsystem matrices are Hurwitz and some of the subsystem matrices are not Hurwitz. Moreover, by exploiting the stabilization property of switching behaviors, IOs for switched systems, whose subsystem matrices are not all Hurwitz, are proposed based on multiple discretized Lyapunov functions. The constructed IOs for the considered switched systems are hybrid dynamical systems and the initialized states of the IOs at each switching time are coupled, since the transformation matrices for different subsystems are different. Finally, we afford an example to illustrate the validity of the derived results.

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