Sequential Multiple Hypothesis Testing and Efficient Fault Detection-Isolation in Stochastic Systems

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Abstract:

This paper provides a new unified approach to optimal detection of abrupt changes in stochastic systems and optimal isolation of the source of the change upon its detection. The approach not only generalizes previous work in the literature on optimal detection-isolation far beyond the relatively simple models treated but also suggests alternative performance criteria which are more tractable and more appropriate for general stochastic systems. In this connection a relatively complete theory of sequential multihypothesis testing for general stochastic systems is also developed, and information bounds for the sequential testing and detection-isolation problems are given.