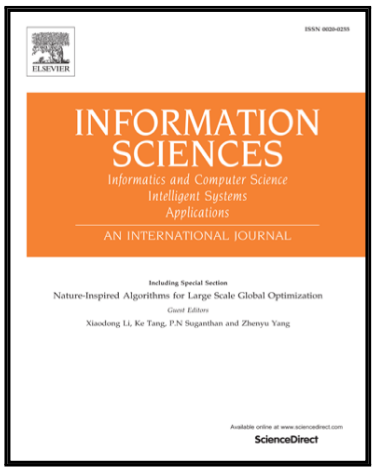

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Moving horizon estimation for Markov jump systems

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Abstract In this paper, we study the state estimation problem for a class of nonlinear Markov jump systems with the moving horizon estimation algorithm, which is an optimization-based filtering method. The optimal estimate is obtained by minimizing a quadratic estimation cost function defined on fixed sliding horizon measurements. For this purpose, the quadratic estimation cost function is formulated from the negative logarithm of the joint states distribution, whose particular factorization is represented by a Bayesian network. By analyzing the corresponding full information estimation as a basic problem for nonlinear Markov jump systems, the formulation of the moving horizon estimation is developed. An example is presented to compare the proposed new estimation technique with classical interacting multiple model particle filtering, and show the effectiveness and advantages of the new estimation scheme.

Keywords Markov jump nonlinear systems; Moving horizon estimation; Bayesian network; Optimization

1 Introduction

Markov jump systems (**MJS**) are a class of stochastic processes for modeling random abrupt changes in the structures and parameters of practical hybrid systems [26]. Motivated by a wide range of practical applications such as radio resource management in cognitive radio networks [11, 24], process monitoring, and maneuver target tracking in guidance systems [13], a great amount of effort has been made on the development of MJS. To better illustrate how the MJS is used in modelling industrial applications, we consider a hybrid power system with multiple electric power sources described in Fig.1, which combines wind turbines, photovoltaic (**PV**) modules, a battery bank, diesel generators, and operates "on-grid". The individual energy