residual to unknown input as well as plant input, while simultaneously enhancing the sensitivity of residual to faults. The main results consist of the formulation of such an FDF design optimization problem and the derivation of solvable conditions, and a systematic solution procedure. The residual evaluation problem is also considered which includes the determination of residual evaluation function and threshold. A numerical example is used to demonstrate the proposed fault detection scheme.

SML04-2

An LMI Approach to Fault Detection Performance Enhancement

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This paper deals with the fault detection problem for linear time-invariant systems with unknown disturbances with aid of the H-infinity optimization and the LMI approach. An iterative LMI algorithm is proposed to design a fault detection observer which aims at enhancing the fault detection and attenuating the effects due to unknown inputs. A numerical example is employed to demonstrate the effectiveness of the present methodology.

SML04-3

Worst-case Fault Detection Observer Design: An LMI Approach

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Guang-Hong Yang
Temasek Laboratories, Singapore

This paper addresses the design problem of a fault detection observer that has a maximized worst-case sensitivity to faults.Sufficient and necessary conditions for the existence of such a fault detection observer are given in terms of Linear Matrix Inequalities (LMIs). Two types of systems are studies, namely, just proper systems and strictly proper systems. For just proper systems, the fault sensitivity over the full frequency spectrum is guaranteed to be higher than a constant lower bound. For strictly proper systems, a weighting filter with infinite amplitude at infinite frequency is used, and the fault sensitivity is guaranteed to be higher than the weighted lower bound.An iterative LMI algorithm is given to obtain the solution, which is shown by numerical examples.

SML04-4

Robust H-infinity State Estimation for Discrete-Time State-Delayed and Measurement-Delayed Systems with Uncertainties

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The University of Hong Kong
Fuwen Yang
Fuzhou University

This paper is concerned with the problem of robust H-infinity state estimation for a class of discrete-time systems with state delay and measurement delay as well as with norm-bounded parameter uncertainties. Sufficient conditions are derived in terms of two algebraic Riccati inequalities for known time-delayed systems to ensure that there exists an asymptotically stable state estimator such that the transfer function from exogenous disturbance to output estimation error satisfies the prescribed H-infinity performance for all admissible perturbations. The results are then extended to the case of robust H-infinity state estimation for a class of discrete-time systems

with unknown state delay and measurement delay as well as with norm-bounded parameter uncertainties. For known time-delay systems, the state estimator derived is independent of parameter uncertainties; and for unknown time-delay systems, the state estimator is independent of parameter uncertainties as well as the time delays.

SML04-5

Robust H-infinity Filtering for Systems with Deterministic and Stochastic Parametric Uncertainties

Fuwen Yang
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Y.S. Hung
The University of Hong Kong

In this paper, a robust H-infinity filter is designed for linear discrete-time systems with both deterministic norm-bounded parameter uncertainty and stochastic multiplicative noise parametric uncertainty. Necessary and sufficient conditions for the existence of the filter which achieves a prescribed estimation error level of disturbance attenuation for all admissible deterministic and stochastic parametric uncertainties are derived in terms of one Linear Matrix Inequality (LMI). Moreover, an optimal filter is obtained by minimizing the prescribed estimation error level subject to the condition of the LMI.

SML04-6

On the Robust State Estimation of Nonlinear Stochastic Systems with State-Dependent Noise

Bor-Sen Chen
National Tsing Hua University
Wei-Hai Zhang
Shandong Institute of Light Industry
Yung-Yue Chen

This paper mainly treats with the state estimator design of non-linear stochastic systems with state dependent noise. The state and measurement are corrupted by internal noise and exogenous disturbance, the exogenous disturbance in system equation is allowed to be stochastic uncertain. Some sufficient conditions on stochastic H-infinity and mixed H-2/H-infinity filter design are given in linear matrix inequalities(LMIs).

SML05-1

System Theory for Information Technology

Xiren Cao, Li Qiu
Hong Kong University of Science & Technology

In this talk, we will survey the applications of system theory in communications, signal processing and networking. We will also give the outlook on other potential applications.

SML05-2

Introduction to the Center for Chaos Control and Synchronization

Guangrong Chen
City University Hong Kong

In this talk, we will introduce to the audience the small but focused Research Center for Chaos Control and Synchronization at the City University of Hong Kong, about its mission, personnel, research projects, academic activities, and international cooperations. The Center was established in September 2000, and has now evolved to having 9 regular members, 2 eminent advisory members, and 60 some active associate members from more than 20 countries over the world. The Center has allied with 7 Research Centers or Institutes, and signed official agreements of cooperations with