Dr.AQEEL SALIM RAHEEM MADHAG publications

التسلسل	اسم البحث	اسم جهة النشر	تاريخ النشر	ملاحظات
1	Mixed ICC/H∞ Control for Systems with Sensors Aging	International Journal of Control	2019	1st author
2	Guaranteed Performance Optimal Control for LPV Systems with Aging Sensors	American Control Conference (ACC)	2019	1st author
3	Gain-Scheduled Control Based on Online Estimated Sensor Aging	Michigan State University	2019	1st author
4	Online Sensor Performance Monitoring and Fault Detection for Discrete Linear Parameter Varying Systems	International Journal of Automation and Control	2019	1st author
5	Online Sensor Aging Detection using a Modified Adaptive Filter	International Journal of Automation and Control	2019	1st author
6	Guarantee performance ICC-LPV control with sensor aging	ASME 2018 Dynamic Systems and Control Conference	2018	1st author
7	Online sensor noise covariance identification using a modified adaptive filter	ASME 2017 dynamic systems and control conference	2017	1st author
8	A distributed navigation strategy for mobile sensor networks with the probabilistic wireless links	Journal of Dynamic Systems, Measurement, and Control	2017	1st author
9	Sensor Noise Covariance Identification Using a Modified Adaptive Filter	Dynamic Systems and Control Conference	2017	1st author
10	Dispersion in Different Single Mode Optical Fiber Material at Different Temperature	Al-Qadisiya Journal of Engineering and Science	2011	1st author
11	EFFECT OF FIBER COMPOSITION ON MATERIAL DISPERSION	1st Scientific Conf. Tech. College-Najaf	2008	1st author
12	Formation and Operation Parameters of SiC Electrodes in Laser Discharge	Engineering and Technology Journal	2008	1st author

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1. **Mixed ICC/H∞ Control for Systems with Sensors Aging**

   A faulty sensor may lead to degraded system performance, system instability, or even a fatal accident. On the other hand, the increasing need for safety and reliability has motivated the development of fault-tolerant control techniques. In this work, the sensor performance degradation due to its aging is modeled by the increment of sensor measurement noise covariance. The main contribution of this paper is the characterization of the control synthesis conditions using parametrized linear matrix inequalities (PLMI) for a multi-objective gain-scheduled noisy output-feedback controller that minimizes the output cost on H2 performance with satisfactory system stability, H1 performance and control input covariance constraints (H2 constraints on the control inputs) in the presence of sensor aging. The closed-loop system stability and performance, in terms of mixed H2/H1 performances, relative improvement, numerical complexity, computation time, and initial conditions response are studied, and a numerical example is used to illustrate the effectiveness of the proposed control scheme. The synthesized controller guarantees not only the stability but also the closed-loop mixed H2/H1 performances, and it is feasible for real-time applications.

2. **Guaranteed Performance Optimal Control for LPV Systems with Aging Sensors**

   The output covariance constraints (OCC) control problem is an optimal control problem that minimizes the control effort subject to performance constraint on the output covariance matrix. Considering that faulty sensor may lead to degraded system performance, system instability, or even a fatal accident. In this work, the sensor performance degradation due to aging is modeled by the increment of sensor measurement noise covariance. The main contribution of this paper is the characterization of the OCC control synthesis conditions using linear matrix inequalities (LMI) for a gain-scheduled noisy output-feedback controller that minimizes the cost on control input with satisfactory system output covariance constraints (OCC control) in the presence of sensor aging. The closed-loop system performance in terms of control effort as a function of the output covariance and the sensor noise covariance is studied, and a numerical example is used to illustrate the effectiveness of the proposed control scheme. The synthesized controller guarantees the closed-loop OCC performance and it is feasible for real-time applications.

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3. **Online Sensor Performance Monitoring and Fault Detection for Discrete Linear Parameter Varying Systems**

   This paper proposes a fault detection algorithm to identify online sensor performance degradation and failure, where the sensor faults are characterized by variations of the sensor measurement noise covariance matrix. That is, the proposed algorithm estimates

   the slowly-varying sensor measurement noise covariance and detects the abrupt and/or intermittent change of sensor measurement noise covariance. A memory-based technique is used to detect the abrupt (or intermittent) change of sensor noise covariance matrix. The memory-based technique is adopted due to its simplicity and online applicability. The proposed algorithm originally is designed for discrete linear time-varying (DLTV) systems and applied to discrete linear parameter-varying (DLPV) systems. Simulation results show that the proposed algorithm is capable of estimating the slowly-varying and detecting the abrupt (or intermittent) change of sensor measurement noise covariance for multiple-input and multiple-output discrete linear parameter-varying systems, where the scheduling parameters lie within a compact set. Furthermore, the proposed estimation algorithm shows a reasonable rate of convergence.

4. **Online Sensor Aging Detection using a Modified Adaptive Filter**

   Modern control systems heavily rely on sensors signals for feedback control, and therefore, sensor performance and fault diagnostics are essential. Degradation of sensor

   performance due to sensor aging affects the closed-loop system performance, reliability, and even stability. Sensor aging can be characterized by the gradual-variation of the sensor measurement noise covariance. This paper proposes a fault detection algorithm to detect online sensor performance degradation and failure due to sensor aging, where the sensor faults due to aging are characterized by slow variations of the sensor measurement noise covariance matrix. To be specific, the key feature of proposed algorithm is online detecting gradual sensor performance degradation due to sensor aging by estimating the slowly-varying sensor measurement noise covariance matrix. The proposed algorithm utilizes the information about the quality of weighted innovation sequence to estimate the slowly-varying sensor noise covariance. The iterative manner of the proposed algorithm leads to significant reduction of the computational load, reduced sensitivity to initial conditions and improved estimation accuracy, making it suitable for online applications. Simulation results show that the proposed algorithm is capable of estimating the slowly-varying sensor noise covariance for multiple-input and multiple-output systems with noise covariance varying linearly, exponentially, or linearly with sinusoid fluctuation. Furthermore, the proposed

estimation algorithm shows a reasonable rate of convergence, better estimation accuracy

and less computation load in contrast to published literature.