



Reliable Control and Filtering of Linear Systems with Adaptive Mechanisms (Automation and Control Engineering)

Guang-Hong Yang, Dan Ye

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More and more, the advanced technological systems of today rely on sophisticated control systems designed to assure greater levels of safe operation while optimizing performance. Rather than assuming always perfect conditions, these systems require adaptive approaches capable of coping with inevitable system component faults. Conventional feedback control designs do not offer that capability and can result in unsatisfactory performance or even instability, which is totally unacceptable in complex systems such as aircraft, spacecraft, and nuclear power plants where safety is a paramount concern.

Reliable Control and Filtering of Linear Systems with Adaptive Mechanisms presents recent research results that are advancing the field. It shows how adaptive mechanisms can be successfully introduced into the traditional reliable control/filtering, so that, based on the online estimation of eventual faults, the proposed adaptive reliable controller/filter parameters are updated automatically to compensate for any fault effects.

Presenting a new method for fault-tolerant control (FTC) in the context of existing research, this uniquely cohesive volume, coauthored by two leading researchers —

- Focuses on the issues of reliable control/filtering in the framework of indirect adaptive method and LMI techniques
- Starts from the development and main research methods in FTC to offer a systematic presentation of new methods for adaptive reliable control/filtering of linear systems
- Explains the principles behind adaptive designs for closed-loop systems in normal operation as well as those that account for both actuator and sensor failures
- Presents rigorous mathematical analysis of control methods as well as easy-to-implement algorithms
- Includes practical case studies derived from the aerospace industry including simulation results for the F-16

The authors also extend the design idea from linear systems to linear time-delay systems via both memory and memory-less controllers. Moreover, some more recent results for the corresponding adaptive reliable control against actuator saturation are included. Ultimately, this remarkably practical resource, offers design approaches and guidelines that researchers can readily employ in the design of advanced FTC techniques offering improved reliability, maintainability, and survivability.

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