



Intelligent Diagnosis and Prognosis of Industrial Networked Systems (Automation and Control Engineering)

By Chee Kiang Pang, Frank L. Lewis, Tong Heng Lee, Zhao Yang Dong



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In an era of intense competition where plant operating efficiencies must be maximized, downtime due to machinery failure has become more costly. To cut operating costs and increase revenues, industries have an urgent need to predict fault progression and remaining lifespan of industrial machines, processes, and systems. An engineer who mounts an acoustic sensor onto a spindle motor wants to know when the ball bearings will wear out without having to halt the ongoing milling processes. A scientist working on sensor networks wants to know which sensors are redundant and can be pruned off to save operational and computational overheads. These scenarios illustrate a need for new and unified perspectives in system analysis and design for engineering applications.

Intelligent Diagnosis and Prognosis of Industrial Networked Systems proposes linear mathematical tool sets that can be applied to realistic engineering systems. The book offers an overview of the fundamentals of vectors, matrices, and linear systems theory required for intelligent diagnosis and prognosis of industrial networked systems. Building on this theory, it then develops automated mathematical machineries and formal decision software tools for real-world applications.

The book includes portable tool sets for many industrial applications, including:

- Forecasting machine tool wear in industrial cutting machines
- Reduction of sensors and features for industrial fault detection and isolation (FDI)
- Identification of critical resonant modes in mechatronic systems for system design of R&D
- Probabilistic small-signal stability in large-scale interconnected power systems
- Discrete event command and control for military applications

The book also proposes future directions for intelligent diagnosis and prognosis in energy-efficient manufacturing, life cycle assessment, and systems of systems architecture. Written in a concise and accessible style, it presents tools that are

mathematically rigorous but not involved. Bridging academia, research, and industry, this reference supplies the know-how for engineers and managers making decisions about equipment maintenance, as well as researchers and students in the field.

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Editorial Review

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