Preface

Systems health management (SHM) has emerged over recent years as significant technologies that are making an impact on both military and commercial maintenance practices. This discipline links studies of failure mechanisms to system lifecycle management and is often referred to as prognostics and health management (PHM), or in transportation applications—vehicle health management (VHM). Technical approaches to building models in SHM/PHM can be categorized broadly into data-driven approach, model-based approach, and hybrid approach. The data-driven approach for SHM/PHM is also explained in condition-based maintenance (CBM). CBM can be applied as a technical architecture and engineering strategy of data-driven PHM. In this book, data-driven PHM/CBM is introduced in details, which mainly emphasis functions of condition monitoring, fault diagnosis, and prognosis.

Condition monitoring, fault diagnosis, and prognosis of engineering systems have received considerable attention in recent years and are increasingly becoming important in industry because of the need to increase reliability and decrease possible loss of production due to faulty systems. Early fault detection, diagnosis, and prognosis can increase system availability and performance, reduce consequential damage, prolong machine life, and reduce spare parts inventories and breakdown maintenance. With the development of artificial intelligence techniques, many intelligent systems have been employed to assist the maintenance management task to correctly interpret the fault data.

This book aims to provide latest research findings and advanced techniques for the fault diagnosis and prognosis area of engineering systems. It introduces the developments and applications of intelligent diagnosis and prognosis techniques in recent years.

This book details the technique for intelligent fault diagnosis and prognosis that implements data-driven approach. Data-driven methodology consists of data acquisition, feature extraction, feature selection, classification, prognosis and data fusion algorithms, etc. for decision making. Each step of data-driven strategy is reviewed including examples. It provides a foundation in the data acquisition,

analysis, feature extraction and selection, classification of equipment faults and prognosis through text discussion, worked examples, applications, and use of modern computer tools. Most chapters include with examples showing how to use these tools to solve situations not easily amenable to analytic solutions. This book provides practice in identifying, formulating, and solving fault diagnosis and prognosis problems. An extensive set of worked examples offers the opportunity to apply concepts discussed in the book to analyze and solve a variety of problems.

The organization and basic subject matter for this book parallel a 17 intensive course entitled “Engineering Systems Health Management” offered by Dr. Gang Niu at Tongji University.

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