

# Preface

Flight data automatically recorded and saved by FDRS in aircraft flight and maintenance is a typical type of time series. The flight data of this type is a recording of the operation states of the aircraft and its subsystems, as well as the change trends of aircraft performance. More importantly, the accumulation of the data along with time will produce massive data that can be used as a source of authentic onboard evidence of aircraft performance and condition. Understandably, it can also be used as a predicator of operation condition of aircraft systems for the early warning of a possible malfunction. Therefore, effective use of the flight data, an area that has recently attracted much research effort, provides a reliable basis for on-condition maintenance, quality control, flight safety assessment, and air accident investigation as well.

While the development of science and technology benefits the world in the information age, there is also an increasing conflict between data redundancy and lack of knowledge. Information mining out of massive data on the one hand, and transformation of the mined information into applicable knowledge on the other, poses a challenge to the research and application of flight data. As a result of this, research efforts have been made to answer to the challenge, and data mining is one of them. As part of the effort to explore the theory and practice of data mining in flight data analysis, and on the basis of the view of flight data as typical time series, the present study provides a detailed and systematic account of the aim of flight data analysis, as well as its procedures and implementation technologies. Integrating in it the latest development in control theory, test technology, and information processing, the present study is also a summary of the contribution of the research team to the study and application of flight data in the past 10 years.

The present volume is made up of six chapters. Chapter 1 is an introduction of the research background, recalling and summarizing the basic notions, developments, and military application of the study of flight data. Chapter 2 deals with flight data preprocessing, providing a theoretical basis, as well as a reliable data source, for the discussion and practice of intelligent data mining in the following chapters. Chapter 3 is an introduction of ARMA model for time series analysis, and its application and technological realization. In Chap. 4, methods of similarity

search of time series are proposed together with a theoretical account of the methods. Chapter 5 focuses on elaborating flight-data-based second development and advanced application for the purpose of condition monitoring, failure diagnosis, and trend prediction of aircraft and its subsystems by means of various data mining methods. Chapter 6 introduces system design and application of intelligent flight data mining.

Many people have contributed to the completion of this book; among them are Profs. Li Xue-ren and Ni Shi-hong from Air Force Engineering University (AFEU), and Prof. Pan Quan from Northwestern Polytechnical University (NWPU). We gratefully acknowledge their help and guidance. It should also be acknowledged that Liang Jian-hai, in his a postdoctoral research at NWPU, has contributed to search and prediction algorithms. Our thanks also go to Song Ji-xue, Liu Bo-ning, Wang Zhan-lei, postgraduates at AFEU, who have helped with the writing and proofreading of some of the draft. Last but not least, we are grateful to all the authors who have been consulted and quoted in the process of writing.

The authors hold themselves to be responsible for all the possible errors in the volume, and welcome suggestions for its improvement.

The book has been a joint effort of six translators who are all English teachers at AFEU. They are Zhao Donglin (Chap. 4), Wu Subin (Chap. 1 and 2), Zhang Jing (Chap. 5), Wang Ningwu (Chap. 5), Jiang Fei (Chap. 3), and Jiang Xuehong (Chap. 6). The completion of the English version is also a result of constant consultation and discussion with the authors for appropriate comprehension and re-rendering of the original text. The whole translation has been reviewed and revised by the authors, Zhao Donglin and Wu Subin.

Xi'an, China  
August, 2016

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Time Series Analysis Methods and Applications for  
Flight Data

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2017, X, 240 p. 161 illus., 35 illus. in color., Hardcover

ISBN: 978-3-662-53428-1