circuits suppress the energy transfer followed by instability. So the power system dynamic problems are often stability problems.

The main aim of the book is to give the reader an understanding of all the topic phenomena. Many of the stability criteria can be explained and used without solving different equations or apply eigenvalue analysis. So in Chapter 2, the power system components are described. After some remarks about the structure of the electric power systems, the generator as the most important unit is described including voltage regulator and turbine governor. As further elements, the substations transformers and compensation elements are explained. The Flexible AC Transmission Systems (FACTS) are controllable power electronic elements, which are very important for improving the system stability. They are described here a little short as well as the high voltage DC transmission. Finally, a survey of the protection is given. In Chapter 3, the steady-state behaviour of the power system is treated. For this, the network elements, mentioned in Chapter 2, are modelled and their equations and equivalent circuits are given. The load flow problem, which is needed to evaluate the steady state of a network in a certain operation point, is described very briefly. The electromechanical phenomena in Chapter 4 concentrate on the synchronous machines during short circuits. Transient and subtransient effects are explained in detail. After that, in Chapter 5 we can read the first differential equation for a generator connected to an infinite bus. For this, a very simple model of second order is chosen, which is based on a constant flux in the excitation windings. In this chapter, the equal area method is introduced. It is very important to understand the energy transfer in the network and quite often it is used in the rest of the book. While Chapter 5 is concentrated to the oscillations after a small disturbance in Chapter 6 the large disturbances are treated. For this, it is necessary to consider the nonlinear effects. This is a problem of the "stability in the large" which is called historically as "transient stability". The explanation starts with the equal area method and ends with the direct method of Lyapunov by using an energy-type function. Additionally, the problems of asynchronous operations are discussed. Only a few words are given about multimachine systems. In more detail, the shaft torsional swings and the sub-synchronous resonance are explained.

The phenomenon of voltage instability in connection with the load behaviour is explained in Chapter 7. In contrary to this, the frequency variation in Chapter 8 is discussed in respect to the parallel operation of several generators. A method to improve the stability by controllable elements is shown in Chapter 9. Beginning with Chapter 10, a more detailed dynamic model of the generator with its excitation and turbine control can be found.

For the dynamic analysis of power systems, it is important to reduce the number and order of differential equations to be solved. To enable this, the author gives the methods of dynamic equivalents in Chapter 11 which is a bit short.

At last, Chapters 12 and 13 explain the mathematical methods of eigenvalues for steady-state stability and the integration methods to solve the transient stability problems also in a short way. Unfortunately, the well-known difference admittance method used in the EMTP-programme is not explained.

With 460 pages, the book gives an excellent presentation of the wide field of power systems dynamics. It is very readably written, especially for students and engineers who want to read a few pages for understanding a certain problem. All important aspects are mentioned by the author but nevertheless the methods to analyse large systems could be explained in more detail.

Dieter Nelles
Faculty of Electrical Engineering and Information Technology,
Institute of Electrical Power Supply,
67653 Kaiserslautern, Germany
E-mail address: nelles@eit.uni-kl.de

About the reviewer
Prof. Dr.-Ing. Dieter Nelles is head of the Electrical Power Supply at the University of Kaiserslautern since 1982. Up to this time, he was head of the Technical Scientific Department of Electrical Engineering with AEG Frankfurt. His main research topic is network dynamic and stability.

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Estimators for uncertain dynamic systems
A. I. Matasov; Kluwer Academic Publishers, Dordrecht, Boston, London, 1998, ISBN 0-7923-5278-5

Modern estimation theory is involved in a wide area of system engineering, including control systems, communication systems, sensor systems, radar systems, etc. A common problem encountered in the study of such systems is the estimation of parameters. In the scope of dynamic systems, the necessity for parameters estimation comes from uncertainties in the modelling process of the system, or from noises in the measurement process. A classical problem of parameters estimation isthe modelling of these uncertainties and noises. The question is what kind of model can be used for these disturbances? In the classical stochastic filtering it is assumed that the probabilistic distributions of disturbances are known. The classical assumption of Gaussian probability density function is well known in this context. But it is often difficult to determine completely these probabilistic distribution of disturbances. In the guaranteed estimation theory it is assumed that the disturbances can be modelled by some deterministic bounded functions, which is more realistic from the point of view of the engineer. A.I. Matasov's book, entitled "Estimators for Uncertain Dynamics Systems" deals with the estimation parameters of linear dynamic systems. The two approaches, stochastic filtering theory and guaranteed estimation are covered in this issue with a lot of details from a theoretical point of view, and with a great number of examples. The main idea developed by the author in his book is that sometimes there are some difficulties to build a solution for the optimal estimator problem, or in the utilization of the optimal estimator, because the optimal estimator is built for a particular model of disturbance and must often be used in another context. So it is necessary to determine the suboptimal estimator, it is then important to evaluate the loss of accuracy between optimal and suboptimal estimators. The book is composed of five chapters. At the end of each chapter the reader can find some comments from the author, these comments are spread by section, and exercises are proposed so as to clearly illustrate the theory.

Chapter one, entitled "guaranteed parameter estimation", presents with the guaranteed parameter estimation problem from some examples. After the statement of the problem, and in order to find an optimal estimator, some necessary and sufficient conditions for the optimality of the estimator are depicted in the case of continuous measurements and in the case of discrete measurements. The combined model for noise measurement is described, this kind of model assumes the noise measurement to be composed of a deterministic uncertain bounded disturbance added to a white Gaussian noise. The computation of an optimal estimator depends on the model of noise, which means that the optimality of the estimator is not guaranteed for any model of noise. A part of this first chapter is devoted to the description of algorithms which can be used to solve the problem of determination of the suboptimal estimator.

Chapter two, entitled "guaranteed estimation in dynamic systems", deals with the problem of parameter guaranteed estimation in dynamic systems, the behaviour of which is described by linear ordinary differential equations. The chapter starts with an abstract of some mathematical results which are necessary for the next stage. Then, a generalization of continuous estimation problem is proposed and necessary and sufficient conditions for the estimator optimality are stated. These different results are used in the remainder of the chapter so as to determine the optimal estimator: several examples of dynamic systems are provided. Chapter two ends with considerations about optimality of linear estimators, and about constraints on the linearity of the phase of the estimator in a guaranteed estimation problem.

Chapter three, entitled "Kalman filter in guaranteed estimation problem", starts with the definition of the level of nonoptimality of simplified estimation algorithms. This definition is then applied to the Kalman filter. The so-called, "nonoptimality level of the Kalman filter in a guaranteed estimation problem" is defined. This value is only determined by the characteristics of the Kalman filter. In order to illustrate the use of this nonoptimality level to analyse and to design estimator algorithms, some examples of dynamic systems are considered which allow to illustrate the computation of a numerical value of the nonoptimality level of the Kalman filter. In this chapter, the continuous measurement case is depicted and then the discrete measurement case is depicted.

Chapter four, entitled "Stochastic guaranteed estimation problem", deals with the consideration of combined noise models. This white noise is assumed to be unknown but with a bounded distribution. After the statement of the optimal guaranteed estimation problem in this context, the definition of a bound of the level of nonoptimality of the Kalman filter is proposed. Some examples are solved so as to illustrate the previous sections. As for Chapter three, the estimate of the nonoptimality level can be considered as a tool to analyse the estimation algorithms. This chapter concludes with the determination of an upperbound for the level of nonoptimality of the Kalman filter with respect to the uncertainty in the noise intensity.

Chapter five, entitled "estimation in dynamic systems with aftereffect", starts with the statement of the problem of guaranteed estimation in dynamic systems with delay. Here, delays appear in the dynamic equation of the system and in its measurement equation. Then, as in Chapter four, the level of nonoptimality in stochastic problem is stated, in this part of the chapter stochastic time-delay dynamic systems are considered, only delays in the dynamic equation of the systems are assumed. From these considerations, an approximation of the optimal estimator problem by a mean square filtering problem is proposed. Unfortunately, this algorithm is still complex, so a simplification of the mean square filtering problem computation is discussed. With respect to the assumption of linear systems for which the estimation problem is equivalent to a control problem, two optimal controls of dynamic systems with delays are studied. Chapter five ends with some simplifications of the mean square filtering problem, discussed for certain kinds of dynamic systems with delays.

A.I. Matasov's book is a very good book, and will surely benefit the researcher who wants to start with the mathematical point of view of the estimation problem for uncertain dynamic systems. The referred literature is quite extensive (215 references) and clearly reviewed.

Moreover, the materials related to the guaranteed estimation are original ones. We can recommend this monograph which provides a broad vision of the state estimation problem.

Philippe Vanheeghe
Jean-Pierre Richard
Ecole Centrale de Lille,
LAIL CNRS UPRES A 8021
Cité Scientifique BP 48 59651,
Villeneuve d'Ascq Cedex, France
philippe.vanheeghe@ec-lille.fr (P. Vanheeghe)
jean-pierre.richard@ec-lille.fr (J.-P. Richard)

About the reviewers

Philippe Vanheeghe was born in France on 20th July 1956. He obtained his Master of Science in data processing from the University of Lille in 1981, his Diploma of Advance study in 1982, and his Ph.D. in 1984. His main interest is modelling and analysis of complex systems. He is presently a professor at "Ecole Centrale de Lille". In addition, he is a member of the French CNRS laboratory "Laboratoire d'Automatique et d'Informatique Industrielle de Lille" (LAIL UPRESA 8021). He is the author or coauthor of several publications in the area of multisensor systems management.

Jean-Pierre Richard was born in 1956. He obtained his D.Sc. in Physical Sciences in 1984, Ph.D. in Automatic Control in 1981, Dipl. Eng. (French "Grande Ecole") in 1979. He is presently a 1st class Professor at the Ecole Centrale de Lille (French "Grande Ecole"). He was elected as a Senior Member IEEE, Member of the Russian Academy of Nonlinear Sciences and of the IFAC TC *Linear Systems*. He is President of the GRAISyHM (Research Group in Integrated Automation and Man–Machine Systems, 230 researchers from 10 labs of Region Nord-Pas de Calais, France) and is heading the team "Nonlinear and delay systems" of the LAIL (Lab. of Automatic control and Computer Sc. for Industry, CNRS UPRES A 8021). His major research fields are delay systems, stabilization and control of continuous systems (linear/nonlinear).

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System identification: theory for the user (second edition)

Lennart Ljung; Prentice-Hall, Englewood Cliffs, NJ, 1999, ISBN 0-13-656695-2

1. Introduction

System modeling plays a fundamental role in modern engineering, as it is typically the first step in a design cycle. However, it is also arguably one of the more complicated tasks in engineering, as it is more closely connected with reality (in contrast with the tasks of analysis and design, which are usually performed on a mathematical model). In some cases, models can be derived from physical reasoning, by quantifying the relationship between the variables underlying the system. Usually, however, one does not have this luxury, and a system model needs to be inferred from experiments performed on the system. This is usually referred to as *System Identification*.

Thus, the broad tasks associated with system identification are:

(1) *Experiment design, and data gathering*: What experiments to conduct, and how many? What, and how much data to gather, and at what rate?
(2) *Model calculation*: What sort of model should be sought? How are the parameters, if any, to be estimated?
(3) *Model validation*: How accurate is the model? What dynamics does the model reflect? Over what range of operating conditions is the model valid?

These tasks are obviously interdependent: For instance, the accessibility or lack thereof to the various signals in the real system will affect the data that can be gathered, which in turn will affect the model that is arrived at eventually. Clearly, there is a trade-off between how good the model is in reproducing and predicting the behavior of the real system, and the effort expended in arriving at it. The eventual application for the derived model determines its complexity and accuracy.

Most researchers in system identification have been drawn naturally to Task 2: Given data, and a set of possible models, find the model that best matches the data. There is an impressive body of research that, for a wide array of model sets, optimality criteria and assumptions on the data, focuses on finding the optimal model. In the communities of researchers in statistics, control and optimization theory, there has been extensive study of issues such as the asymptotic properties of the optimal model as the data set grows larger and larger, and the conditions under which the data enables the determination of a unique optimal model from the model set. This research has provided answers, which in turn influence the tasks of experiment design, data gathering and model validation.

In view of the importance of Task 2, it is not surprising, therefore, that a few existing texts and monographs in system identification focus on a certain subset of problems from Task 2 (these are usually motivated by the underlying applications). Examples are the monograph by Juang (1996), which, motivated by space applications, focuses on the identification of state-space models; the monograph by van Overschee and de Moor (1996), on subspace methods for the identification of linear state-space models; and the monograph by Chen and