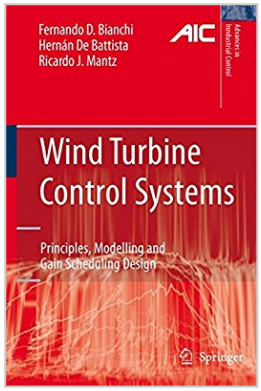

Wind Turbine Control Systems: Principles, Modelling and Gain Scheduling Design (Advances in Industrial Control)

By Fernando D. Bianchi, Hernán de Battista, Ricardo J. Mantz

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This book emphasizes the application of Linear Parameter Varying (LPV) gain scheduling techniques to the control of wind energy conversion systems. This reformulation of the classical problem of gain scheduling allows straightforward design procedure and simple controller implementation. From an overview of basic wind energy conversion, to analysis of common control strategies, to design details for LPV gain-scheduled controllers for both fixed- and variable-pitch, this is a thorough and informative monograph.

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Editorial Review

Review

From the reviews:

"The book in my hand is the first … completely dedicated to the control of wind energy systems; more precisely, it addresses a specific control design approach, the gain scheduling. … This monograph is addressed mainly to scientists from academia, but the reader can perceive its utility for industrials as well. … I feel that this book has achieved what the authors set out to do … ." (Iulian Munteanu, International Journal of Robust and Nonlinear Control, Vol. 18, 2008)

“The authors of Wind Turbine Control Systems are knowledgeable about the subject, having published several papers in this area … . Wind Turbine Control Systems provides a good introduction to wind energy for control engineers … . The target audience for this text is members of the control research community who are interested in wind energy applications. … provides an overview of wind turbines with an emphasis on various control objectives and LPV-based strategies for control.” (Kathryn E. Johnson, IEEE Control Systems Magazine, Vol. 27 (5), October, 2007)

From the Back Cover

Modern wind turbines generally operate at variable speed in order to maximise the conversion efficiency below rated power and to reduce loading on the drive-train. In addition, pitch control of the blades is usually employed to limit the energy captured during operation above rated wind speed. The higher complexity of variable-speed variable-pitch turbines is offset by the benefits of control flexibility, namely, higher conversion efficiency, better power quality, longer useful life; because of the immediate impact of control on the cost of wind energy, reliable high-performance controllers are essential in making wind technology competitive.

In *Wind Turbine Control Systems* the application of linearparameter varying (LPV) gain scheduling techniques to the control of wind energy conversion systems is emphasised. This recent reformulation of the classical gain scheduling problem allows a straightforward design procedure and simple controller implementation. The monograph provides a thorough coverage of wind turbine control, including:

• an overview of the principles of wind energy conversion;

• the control-oriented modelling of wind turbines;

• an in-depth analysis of the most common control strategies;

• the design of LPV gain-scheduled controllers for both fixed- and variable-pitch, variable-speed wind turbines.

Wind Turbine Control Systems is primarily intended for researchers and students with a control background wishing to expand their knowledge of wind energy systems. The book will be useful to scientists in the field

of control theory looking to apply their innovative control ideas to this appealing control problem and will also interest practising engineers dealing with wind technology who will benefit from the comprehensive coverage of the theoretic control topics, the simplicity of the models and the use of commonly available control algorithms.

Advances in Industrial Control aims to report and encourage the transfer of technology in control engineering. The rapid development of control technology has an impact on all areas of the control discipline. The series offers an opportunity for researchers to present an extended exposition of new work in all aspects of industrial control.

About the Author

Fernando D. Bianchi received the B.S. and Dr. Eng. degrees in electronic engineering from National University of La Plata, Argentina. He is currently a Postdoctoral Fellow of the National Research Council of Argentina (CONICET) at Laboratory of Industrial Electronics, Control and Instrumentation (LEICI), Electrical Engineering Department, National University of La Plata. His research interests include the application of gain scheduling techniques and robust control to wind energy systems. Refereed journal articles: 8; refereed articles in conference proceedings: 11.

Hernán De Battista received the B.S. and Dr. Eng. degrees in Electronic Engineering from the National University of LaPlata, Argentina. He is currently Senior Professor of Electronics in the EE Dept. at the same university, and Research Member of the National Research Council of Argentina. His research interests are in the field of nonlinear control applications. He is particularly concerned with renewable energy control systems. Refereed journal articles: 18; refereed articles in conference proceedings: 21.

Ricardo J. Mantz received his BSEE degree in Electronic Engineering from the National University of La Plata, Argentina in 1980. Since then, he has been with the Laboratory of Industrial Electronics Control and Instrumentation (LEICI) at the EE Dept., Faculty of Engineering, National University of La Plata, where he currently serves as Full Professor of Automatic Control. Professor Mantz is also a Research Member of the Scientific Research Commission (CICpBA). His primary area of interest is nonlinear control systems. Refereed journal articles: 42; refereed articles in conference proceedings: 59.

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