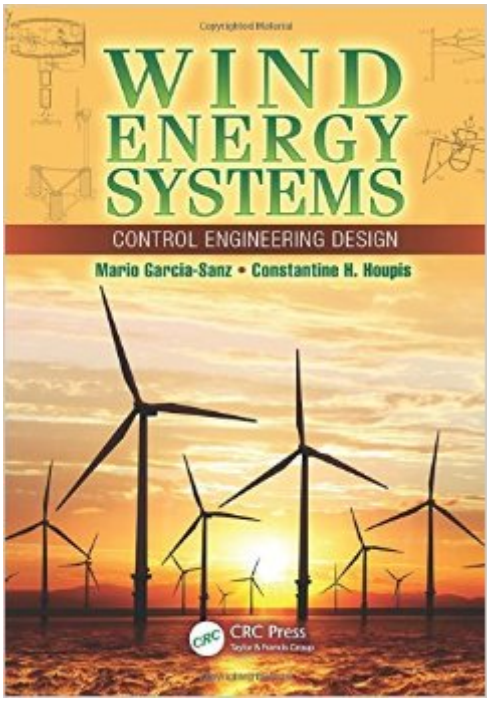
Wind Energy Systems: Control Engineering Design



Synopsis

This book describes the design and field experimentation of real-world multi-megawatt wind turbines and their control systems. It introduces the main topics of modern wind turbine design and control, including (1) the description of classical and advanced turbines, (2) dynamic modeling, (3) control objectives and strategies, (4) standards and certification, (5) controller design, and (6) a large number of applications like onshore and offshore wind turbines, floating wind turbines, airborne wind energy systems, advanced manufacturing and real experimentation.Â The book also presents the main concepts of the QFT robust control engineering technique in such a manner that students and practicing engineers can readily grasp the fundamentals and appreciate its transparency in bridging the gap between theory and the real world. It addresses state-of-the-art of QFT methods to design control systems for multi-input multi-output applications, distributed parameter systems, and a hybrid methodology to design non-linear robust control systems able to go beyond the classical linear limitations.Â The book includes one of the most advanced interactive object-oriented CAD tool for QFT controller design with MATLAB, developed with the European Space Agency. (See also the websiteÂ cesc.case.edu/OurQFTCT.htm).

Book Information

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Customer Reviews

Fundamentals on QFT and Wind turbines are brought together in this exciting two-in-one book. High-quality pictures, in-depth but clear explanations, well-balanced combination of theory and practice make this book strongly advisable to all levels: from undergraduate engineering students

interested in gaining insight in modern control theory, to wind energy professionals looking for a reference book with solid background on mathematical modelling and control of wind turbines. Last but not least, the QFT toolbox developed by the authors and freely available is a must for those readers interested in practicing themselves with QFT control design while reading the book.

This is a 'double' book combining Robust Control theory (QFT) and the fundamentals of Wind Turbines for Control Engineers and Scientists, a challenging and important application in today's renewable energy world.The book introduces the main topics of modern wind turbine design and control, including (1) the description of classical and advanced turbines, (2) dynamic modeling, (3) control objectives and strategies, (4) standards and certification, (5) controller design, and (6) a large number of applications like onshore and offshore wind turbines, floating wind turbines, and airborne wind energy systems. In support of the theory the book includes real-world industrial projects and real data of multi-megawatt wind turbines on which the author has worked on himself. Therefore, there is a lot of real world experience behind writing this book.In addition, the book dives into the concepts of QFT robust control engineering theory in such a manner that students and practicing engineers can readily grasp the fundamentals and appreciate its transparency in bridging the gap between theory and the real world. It addresses state-of-the-art QFT methods to design control systems for multi-input multi-output (MIMO) applications, distributed parameter systems (DPS), and a hybrid methodology to design non-linear robust control systems able to go beyond the classical linear limitations.Lastly, the book includes a free download of the last generation of the QFT Control Toolbox for Matlab, developed by the author and his research team. This tool is an interactive object-oriented CAD tool for QFT controller design with MATLAB and will give you the ability to readily start applying QFT Robust Control in real world problems.

This book is two books in one. Firstly, it is a comprehensive and up-to-date presentation of Quantitative Feedback Theory, an engineering-oriented control design technique that emphasizes the use of feedback to deal with plant uncertainty and unknown disturbances. QFT is renowned for its transparency and applicability to a wide range of real-world problems. Its foundation on classical frequency domain control makes it very attractive to practicing engineers who want to achieve optimal performance without renouncing to mathematical simplicity. Thebook covers the fundamentals of QFT in a very didactic way, but it also covers the most recent developments in the area, including multivariable and distributed parameter control, and switching techniques to overcome the fundamental limitations of linear controllers. Secondly, the book presents a thorough

description of wind turbine control, including dynamical models, specifications and controller design. The book also includes real-world examples and data, benefiting enormously form the author's long experience in the field.