Preface

Mastering the synergy of electromagnetics, control, power electronics and mechanical concepts remains an intellectual challenge. Nevertheless, this barrier must be overcome by engineers and senior students who have a need or desire to comprehend the theoretical and practical aspects of modern electrical drives. In this context, the term drive represents a plethora of motion control systems as present in industry.

This book *Advanced Electrical Drives* builds on basic concepts outlined in the book *Fundamentals of Electrical Drives* by the same authors. Hence, it is prudent for the uninitiated reader to consider this material prior to tackling the more advanced material presented in this text. Others well versed in the basic concepts of electrical drives should be able to readily assimilate the material presented as every effort has been made to ensure that the material presented can be mastered without the need to continually switch between the books.

In our previous work, the unique concept of an *ideal rotating transformer* (IRTF), as developed by the authors, was introduced to facilitate the basic understanding of torque production in electrical machines. The application of the IRTF module to modern electrical machines as introduced in *Fundamentals of Electrical Drives* is fully explored in this volume and as such allows the user to examine a range of unique dynamic and steady-state machine models which covers brushed DC, non-salient/salient synchronous and induction machines.

In addition, this volume explains the *universal field oriented* (UFO) concept which demonstrates the concepts of modern vector control and exemplifies the seamless transition between so-called *stator flux* and *rotor flux* oriented control techniques. This powerful tool is used for the development of flux oriented machine models of rotating field machines. These models form the basis of UFO vector control techniques which are covered extensively together with traditional drive concepts. In the last sections of this book, attention is given to the dynamic modeling of *switched reluctance* (SR)
drives, where a comprehensive set of modeling tools and control techniques are presented which are complemented by a set of build and play modules.

As with the previous book, the interactive learning process using build and play modules is continued. Again the simulation tool CASPOC is used which contains a tailored set of modules which bring to life the circuit and generic models introduced in the text. This approach provides the reader with the opportunity to interactively explore and fully comprehend and visualize the concepts presented in this text. For this purpose, realtime modules which allow the reader to view the simulations without further software licensing needs are provided on the Springer website (http://extras.springer.com).

The text Advanced Electrical Drives should appeal to the readers in industry and universities who have a desire or need to understand the intricacies of modern electrical drives without loosing sight of the fundamental principles. The book brings together the concepts of IRTF and UFO which allows a comprehensive and insightful analysis of AC electrical drives in terms of modeling and control. Particular attention is also given to switched reluctance drives modeling methods and modern control techniques. Extensive use is made of build and play modules in this book which for the first time provides the user with the ability to interactively examine and understand the topics present in this book.

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