

Preface

“There is nothing so practical as a good theory”—Kurt Lewin claimed,¹ taking part in the ongoing debate between practitioners and scientists about their relationship and the desirability of applied research as opposed to basic research. Any engineer working in the field of power electronics and drives has to support this statement strongly, having in mind control theory, artificial and computational intelligence, or signal processing. On the other hand, there is nothing more stimulating for the development of a theory as a strong need for practical applications and the influence of smart, practical solutions that may be generalized and become a part of the general approach. Power electronics and variable frequency drives are continuously developing multidisciplinary fields which require applications of the recently developed techniques of modern control theory and provide an important impulse for the development of new predictive, nonlinear and robust control methods. That is why the book concerning recent solutions in control of power electronics and drives appears in the series “Studies in Systems, Decisions and Control.”

The presented contributed volume is written by key specialists working in multidisciplinary fields in electrical engineering, linking control theory, power electronics, artificial neural networks, embedded controllers, and signal processing. The authors of each chapter report the state of the art of the various topics addressed and present results of their own research, laboratory experiments, and successful applications. The presented solutions concentrate on three main areas of interest: motion control in complex electromechanical systems, including sensorless control; fault-diagnosis and fault-tolerant control of electric drives; and new control algorithms for power electronics converters.

I believe that particular chapters and the complete book possess strong monograph attributes. Important practical and theoretical problems are deeply and accurately presented on the background of an exhaustive state-of-the-art review.

¹Lewin, K. (1951). Problems of research in social psychology. In D. Cartwright (Ed.), *Field theory in social science: Selected theoretical papers* (pp. 155–169). New York: Harper & Row. (p. 169), although the same quotation is sometimes attributed to James Clerk Maxwell, Ludwig Boltzmann, or even Leonid Brezhnev.

Many results are completely new and were never published before. Therefore, this book will be interesting for a wide audience:

- researchers working in control, especially nonlinear control, model predictive control, and fault-tolerant control, who are interested in challenges caused by practical applications;
- experts in power electronics, electrical machines, motion control, and drives, who are involved in the use of advanced control methods;
- creative industry engineers and constructors faced with new challenging applications; and
- graduate and Ph.D. students of control, electrical engineering, power conversion, robotics, or mechatronics.

The idea of this book originated among the research community gathered around the conference Control in Power Electronics and Electric Drives. It is a leading Polish Conference devoted to power electronics, motion control, electric drives automation, and control theory application. It is a regular biennial event with a very long tradition—the 13th edition will be organized in November 2017. The conference is organized by the Institute of Automatic Control, Lodz University of Technology, always in Lodz, under auspices of the Committee on Electrical Engineering, Polish Academy of Sciences, and in cooperation with IEEE (Polish section). The event is the main meeting forum for researchers, developers, and specialists from the industry. I cordially invite the readers of the presented book to participate in future editions of our conference.

I would like to express my sincere gratitude to numerous persons, who contributed to the edition of this book:

- the authors, who worked hard to make their chapters perfect and in time; apologies if I made you be under a pressure from time to time;
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