Preface

Sliding mode control, also known as variable structure control, is an important robust control approach and has attractive features to keep systems insensitive to uncertainties on the sliding surface. For the class of systems to which it applies, sliding mode controller design provides a systematic approach to the problem of maintaining stability and consistent performance in the face of modeling imprecision. On the other hand, by allowing tradeoffs between modeling and performance to be quantified in a simple fashion, it can illuminate the whole design process. Sliding mode schemes have become one of the most exciting research topics in several fields such as electric drives and actuators, power systems, aerospace vehicles, robotic manipulators, biomedical systems, etc. In its earlier approach, an infinite frequency control switching was required to maintain the trajectories on a prescribed sliding surface and then eventually to enforce the orbit tending to the equilibrium point along the sliding surface. However, in practice the system states do not really locate on the designed sliding surface after reaching it due to numerically discretizing errors, signal noise, as well as structural uncertainties in the dynamical equations. Since the controller was fast switched during operation, the system underwent oscillation crossing the sliding plane. Around the sliding surface is often irritated by high frequency and small amplitude oscillations known as chattering. The phenomenon of chattering is a major drawback of SMC, which makes the control power unnecessarily large. To eliminate chattering, some methods are being developed.

This book consists of 21 contributed chapters by subject experts specialized in the various topics addressed in this book. The special chapters have been brought out in this book after a rigorous review process. Special importance was given to chapters offering practical solutions and novel methods for recent research problems in the main areas of this book. The objective of this book is to present recent theoretical developments in sliding mode control and estimation techniques as well as practical solutions to real-world control engineering problems using sliding mode methods. The contributed chapters provide new ideas and approaches, clearly indicating the advances made in problem statements, methodologies, or applications with respect to the existing results. The book is not only a valuable title on the

publishing market, but is also a successful synthesis of sliding mode control in the world literature.

As the editors, we hope that the chapters in this book will stimulate further research in sliding mode control methods for use in real-world applications. We hope that this book, covering so many different aspects, will be of value to all readers.

We would like to thank also the reviewers for their diligence in reviewing the chapters.

Special thanks go to Springer publisher, especially for the tireless work of the series editor "Studies in Computational Intelligence," Dr. Thomas Ditzinger.

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http://www.springer.com/978-3-319-11172-8

Advances and Applications in Sliding Mode Control systems

Azar, A.T.; Zhu, Q. (Eds.)
2015, XI, 590 p. 280 illus., Hardcover
ISBN: 978-3-319-11172-8