Chaos in Electric Drive Systems. Analysis, Control and Application

Description: In Chaos in Electric Drive Systems: Analysis, Control and Application authors Chau and Wang systematically introduce an emerging technology of electrical engineering that bridges abstract chaos theory and practical electric drives. The authors consolidate all important information in this interdisciplinary technology, including the fundamental concepts, mathematical modeling, theoretical analysis, computer simulation, and hardware implementation. The book provides comprehensive coverage of chaos in electric drive systems with three main parts: analysis, control and application. Corresponding drive systems range from the simplest to the latest types: DC, induction, synchronous reluctance, switched reluctance, and permanent magnet brushless drives.

- The first book to comprehensively treat chaos in electric drive systems
- Reviews chaos in various electrical engineering technologies and drive systems
- Presents innovative approaches to stabilize and stimulate chaos in typical drives
- Discusses practical application of chaos stabilization, chaotic modulation and chaotic motion
- Authored by well-known scientists in the field
- Lecture materials available from the book's companion website

This book is ideal for researchers and graduate students who specialize in electric drives, mechatronics, and electric machinery, as well as those enrolled in classes covering advanced topics in electric drives and control. Engineers and product designers in industrial electronics, consumer electronics, electric appliances and electric vehicles will also find this book helpful in applying these emerging techniques.

Lecture materials for instructors available at company website

Contents:

Preface xi
Organization of this Book xiii
Acknowledgments xv
About the Authors xvii

PART I INTRODUCTION.

1 Overview of Chaos 3

1.1 What is Chaos? 3
1.2 Development of Chaology 4
1.3 Chaos in Electrical Engineering 8
1.3.1 Chaos in Electronic Circuits 9
1.3.2 Chaos in Telecommunications 10
1.3.3 Chaos in Power Electronics 11
1.3.4 Chaos in Power Systems 12
1.3.5 Chaos in Electric Drive Systems 13

2 Introduction to Chaos Theory and Electric Drive Systems 23
2.1 Basic Chaos Theory 23
2.1.1 Basic Principles 23
2.1.2 Criteria for Chaos 28
2.1.3 Bifurcations and Routes to Chaos 29
2.1.4 Analysis Methods 37
2.2 Fundamentals of Electric Drive Systems 45
2.2.1 General Considerations 45
2.2.2 DC Drive Systems 50
2.2.3 Induction Drive Systems 56
2.2.4 Synchronous Drive Systems 61
2.2.5 Doubly Salient Drive Systems 68
PART II ANALYSIS OF CHAOS IN ELECTRIC DRIVE SYSTEMS.
3 Chaos in DC Drive Systems 81
3.1 Voltage-Controlled DC Drive System 81
3.1.1 Modeling 81
3.1.2 Analysis 83
3.1.3 Simulation 87
3.1.4 Experimentation 94
3.2 Current-Controlled DC Drive System 96
3.2.1 Modeling 96
3.2.2 Analysis 98
3.2.3 Simulation 102
3.2.4 Experimentation 108
4 Chaos in AC Drive Systems 113
4.1 Induction Drive Systems 113
4.1.1 Modeling 113
4.1.2 Analysis 116
4.1.3 Simulation 117
4.1.4 Experimentation 118
4.2 Permanent Magnet Synchronous Drive Systems 119
4.2.1 Modeling 120
4.2.2 Analysis 122
7.1.1 Time-Delay Feedback Control of PMDC Drive System 193
7.1.2 Time-Delay Feedback Control of PM Synchronous Drive System 199
7.1.3 Proportional Time-Delay Control of PMDC Drive System 201
7.1.4 Chaotic Signal Reference Control of PMDC Drive System 204
7.2 Design-Oriented Chaoization 207
7.2.1 Doubly Salient PM Drive System 209
7.2.2 Shaded-Pole Induction Drive System 219

PART IV APPLICATION OF CHAOS IN ELECTRIC DRIVE SYSTEMS.
8 Application of Chaos Stabilization 235
8.1 Chaos Stabilization in Automotive Wiper Systems 235
8.1.1 Modeling 236
8.1.2 Analysis 238
8.1.3 Stabilization 240
8.2 Chaos Stabilization in Centrifugal Governor Systems 246
8.2.1 Modeling 247
8.2.2 Analysis 248
8.2.3 Stabilization 248
8.3 Chaos Stabilization in Rate Gyro Systems 250
8.3.1 Modeling 251
8.3.2 Analysis 253
8.3.3 Stabilization 253

9 Application of Chaotic Modulation 257
9.1 Overview of PWM Schemes 257
9.1.1 Voltage-Controlled PWM Schemes 257
9.1.2 Current-Controlled PWM Schemes 260
9.2 Noise and Vibration 261
9.3 Chaotic PWM 263
9.3.1 Chaotic Sinusoidal PWM 265
9.3.2 Chaotic Space Vector PWM 269
9.4 Chaotic PWM Inverter Drive Systems 271
9.4.1 Open-Loop Control Operation 272
9.4.2 Closed-Loop Vector Control Operation 273

10 Application of Chaotic Motion 283

10.1 Chaotic Compaction 283

10.1.1 Compactor System 285

10.1.2 Chaotic Compaction Control 286

10.1.3 Compaction Simulation 287

10.1.4 Compaction Experimentation 290

10.2 Chaotic Mixing 292

10.2.1 Mixer System 293

10.2.2 Chaotic Mixing Control 294

10.2.3 Chaotic Mixing Simulation 295

10.2.4 Chaotic Mixing Experimentation 298

10.3 Chaotic Washing 301

10.3.1 Chaotic Clothes-Washer 302

10.3.2 Chaotic Dishwasher 304

10.4 Chaotic HVAC 306

10.5 Chaotic Grinding 309

References 312

Index

Ordering:
Order Online - http://www.researchandmarkets.com/reports/2171226/

Order by Fax - using the form below

Order by Post - print the order form below and send to

Research and Markets,
Guinness Centre,
Taylors Lane,
Dublin 8,
Ireland.
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct.

<table>
<thead>
<tr>
<th>Product Format</th>
<th>Please select the product format and quantity you require:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Name:</strong></td>
<td>Chaos in Electric Drive Systems. Analysis, Control and Application</td>
</tr>
<tr>
<td><strong>Web Address:</strong></td>
<td><a href="http://www.researchandmarkets.com/reports/2171226/">http://www.researchandmarkets.com/reports/2171226/</a></td>
</tr>
<tr>
<td><strong>Office Code:</strong></td>
<td>SCDV2G1Z</td>
</tr>
</tbody>
</table>

Product Format
Please select the product format and quantity you require:

<table>
<thead>
<tr>
<th>Hard Copy (Hard Back)</th>
<th>USD 152 + USD 28 Shipping/Handling</th>
</tr>
</thead>
</table>

* Shipping/Handling is only charged once per order.

Contact Information
Please enter all the information below in **BLOCK CAPITALS**

<table>
<thead>
<tr>
<th>Title:</th>
<th>Mr [ ] Mrs [ ] Dr [ ] Miss [ ] Ms [ ] Prof [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Last Name:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Email Address: *</td>
<td>[ ]</td>
</tr>
<tr>
<td>Job Title:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Organisation:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Address:</td>
<td>[ ]</td>
</tr>
<tr>
<td>City:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Postal / Zip Code:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Country:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Phone Number:</td>
<td>[ ]</td>
</tr>
<tr>
<td>Fax Number:</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box:

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:
Account number 833 130 83
Sort code 98-53-30
Swift code ULSBIE2D
IBAN number IE78ULSB98533083313083
Bank Address Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: ________________________________

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World