

**Systems with Hysteresis. Analysis, Identification and Control Using the Bouc-Wen Model**

**Description:**
Hysteresis is a system property that is fundamental to a range of engineering applications as the components of systems with hysteresis are able to react differently to different forces applied to them. Control theory is used to model these complex systems and cause them to behave in the desired manner; the Bouc-Wen model is a well-known semi-physical model that is used extensively to describe the hysteresis of systems in the areas of smart structures and civil engineering. The Bouc-Wen model for system hysteresis has increased in popularity due to its capability of capturing in an analytical form a range of shapes of hysteretic cycles that match the behaviour of a wide class of hysteretic systems. "Systems with Hysteresis: Analysis, Identification and Control using the Bouc-Wen Model" deals with the analysis, identification and control of these systems, and offers a comprehensive and self-contained framework for the study of the Bouc-Wen model.  

- Includes the latest techniques for modelling smart structures and materials  
- Provides a rigorous mathematical treatment of the subject along with practical comments, numerical solutions and a case study of magentorheological (MR) dampers.  
- Begins by analysing the compatibility of the Bouc-Wen model with the laws of physics, and continues to cover the relationship between the model parameters and hysteresis loop, identification of the model parameters and control of systems that include a hysteretic part described by the Bouc-Wen model.  
- Includes case studies covering the identification and control of smart material transducers for use in automotive, aerospace and structural control

Systems with Hysteresis: Analysis, Identification and Control using the Bouc-Wen Model offers an invaluable source of ideas, concepts and insights for engineers, researchers, lecturers and senior/postgraduate students involved in the research, design and development of smart structures and related areas within civil and mechanical engineering. It will also be of interest to readers involved in the wider disciplines of electrical & control engineering, applied mathematics, applied physics and material science.

**Contents:**

- Preface.  
- List of Figures.  
- List of Tables.  

1. Introduction  
1.1 Objective and contents of the book  
1.2 The Bouc-Wen model: origin and literature review  

2. Physical consistency of the Bouc-Wen model  
2.1 Introduction  
2.2 BIBO stability of the Bouc-Wen model  
2.2.1 The model  
2.2.2 Problem statement  
2.2.3 Classification of the BIBO stable Bouc-Wen models  
2.2.4 Practical remarks  
2.3 Free motion of a hysteretic structural system
2.3.1 Problem statement
2.3.2 Asymptotic trajectories
2.3.3 Practical remarks
2.4 Passivity of the Bouc-Wen model
2.5 Limit cases
2.5.1 The limit case $n = 1$
2.5.2 The limit case $\gamma = 1$
2.5.3 The limit case $\gamma = 0$
2.5.4 The limit case $\bar{\gamma} + \delta = 0$
2.6 Conclusion

3 Forced limit cycle characterization of the Bouc-Wen model
3.1 Introduction
3.2 Problem statement
3.2.1 The class of inputs
3.2.2 Problem statement
3.3 The normalized Bouc-Wen model
3.4 Instrumental functions
3.5 Characterization of the asymptotic behavior of the hysteretic output
3.5.1 Technical Lemmas
3.5.2 Analytic description of the forced limit cycles for the Bouc-Wen model
3.6 Simulation example
3.7 Conclusion

4 Variation of the hysteresis loop with the Bouc-Wen model parameters
4.1 Introduction
4.2 Background results and methodology of the analysis
4.2.1 Background results
4.2.2 Methodology of the analysis
4.3 Maximal value of the hysteretic output
4.3.1 Variation with respect to $\pm$
4.3.2 Variation with respect to $\frac{1}{2}$
4.3.3 Variation with respect to $n$
4.3.4 Summary of the obtained results

4.4 Variation of the zero of the hysteretic output
4.4.1 Variation with respect to $\pm$
4.4.2 Variation with respect to $\frac{1}{2}$
4.4.3 Variation with respect to $n$
4.4.4 Summary of the obtained results

4.5 Variation of the hysteretic output with the Bouc-Wen model parameters
4.5.1 Variation with respect to $\pm$
4.5.2 Variation with respect to $\frac{1}{2}$
4.5.3 Variation with respect to $n$
4.5.4 Summary of the obtained results

4.6 The four regions of the Bouc-Wen model
4.6.1 The linear region $R_l$
4.6.2 The plastic region $R_p$
4.6.3 The transition regions $R_t$ and $R_s$

4.7 Interpretation of the normalized Bouc-Wen model parameters
4.7.1 The parameters $\frac{1}{2}$ and $\pm$
4.7.2 The parameter $\frac{3}{4}$
4.7.3 The parameter $n$

4.8 Conclusion

5 Robust identification of the Bouc-Wen model parameters
5.1 Introduction
5.2 Parameter identification for the Bouc-Wen model
5.2.1 Class of inputs
5.2.2 Identification methodology
5.2.3 Robustness of the identification method
5.2.4 Numerical simulation example
5.3 Modeling and identification of a magnetorheological damper

5.3.1 Some insights into the viscous + Bouc-Wen model for shear mode MR dampers

5.3.2 Alternatives to the viscous + Bouc-Wen model for shear mode MR dampers

5.4 Identification methodology for the viscous + Dahl model

5.4.1 Numerical simulations

5.5 Conclusion

6 Control of a system with a Bouc-Wen hysteresis

6.1 Introduction and problem statement

6.2 Control design and stability analysis

6.3 Numerical simulation

6.4 Conclusion

A Mathematical background

A.1 Existence and uniqueness of solutions

A.2 Concepts of stability

A.3 Passivity and absolute stability

A.3.1 Passivity in mechanical systems

A.3.2 Positive realness

A.3.3 Sector functions

A.3.4 Absolute stability

A.4 Input-output properties

References.

Index.

Ordering: Order Online - http://www.researchandmarkets.com/reports/2170498/

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.

Product Name: Systems with Hysteresis. Analysis, Identification and Control Using the Bouc-Wen Model
Web Address: http://www.researchandmarkets.com/reports/2170498/
Office Code: SCAYPELK

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

<table>
<thead>
<tr>
<th>Quantity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Copy (Hard Back)</td>
<td>USD 145 + USD 28 Shipping/Handling</td>
</tr>
</tbody>
</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</th>
<th>Mrs</th>
<th>Dr</th>
<th>Miss</th>
<th>Ms</th>
<th>Prof</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email Address:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Job Title:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postal / Zip Code:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone Number:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fax Number:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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