

MECHANICAL ENGINEERING SERIES

Wodek K. Gawronski

# Dynamics and Control of Structures

A Modal Approach



Springer

# Dynamics And Control Of Structures A Modal Approach

**Wodek Gawronski**



## **Dynamics And Control Of Structures A Modal Approach:**

Dynamics and Control of Structures Wodek K. Gawronski, 2004-07-14 Robots aerospace structures active earthquake damping devices of tall buildings and active sound suppression are examples of the application of structural dynamics and control methods This book addresses the structural dynamics and control problems encountered by mechanical civil and control engineers Many problems presented in this book originated in recent applications in the aerospace industry and have been solved using the approach presented here Dynamics analysis and controller design for flexible structures require a special approach due to the large size of structural models and because flexible structure testing and control typically requires massive instrumentation sensors and actuators But the rapid development of new technologies and the increased power of computers allows for the formulation and solution of engineering problems that seemed to be unapproachable not so very long ago The modal approach was chosen in this book It has a long tradition in structural engineering see e g 84 87 and 26 and is also used in control system analysis e g 93 Its usefulness thoroughly tested does not need extensive justification Both structural testing and analysis give priority to the modal representation due to its compactness simplicity and explicit physical interpretation Also many useful structural properties are properly exposed only in modal coordinates In this book the modal approach preferred by structural engineers is extended into control engineering giving new analytical results and narrowing the gap between structural and control analysis

**Dynamics and Control of Structures** Leonard Meirovitch, 1991-01-16 A text reference on analysis of structures that deform in use Presents a new integrated approach to analytical dynamics structural dynamics and control theory and goes beyond classical dynamics of rigid bodies to incorporate analysis of flexibility of structures Includes real world examples of applications such as robotics precision machinery and aircraft structures

**Advanced Structural Dynamics and Active Control of Structures** Wodek Gawronski, 2007-06-14 Science is for those who learn poetry for those who know Joseph Roux This book is a continuation of my previous book Dynamics and Control of Structures 44 The expanded book includes three additional chapters and an additional appendix Chapter 3 Special Models Chapter 8 Modal Actuators and Sensors and Chapter 9 System Identification Other chapters have been significantly revised and supplemented with new topics including discrete time models of structures limited time and frequency grammians and reduction almo balanced modal models simultaneous placement of sensors and actuators and structural damage detection The appendices have also been updated and expanded Appendix A consists of thirteen new Matlab programs Appendix B is a new addition and includes eleven Matlab programs that solve examples from each chapter In Appendix C model data are given Several books on structural dynamics and control have been published Meirovitch s textbook 108 covers methods of structural dynamics virtual work d Alambert s principle Hamilton s principle Lagrange s and Hamilton s equations and modal analysis of structures and control pole placement methods LQG design and modal control Ewins s book 33 presents methods of modal testing of structures Natke s book 111 on structural identification also contains

excellent material on structural dynamics Fuller Elliot and Nelson 40 cover problems of structural active control and structural acoustic control *Dynamics and Control of Structures* Wodek K. Gawronski, 2004 This work addresses problems in structural dynamics and control encountered in such applications as robotics aerospace structures earthquake damage prevention and active noise suppression *Technology for Large Space Systems*, 1986 **Large Space Structures & Systems in the Space Station Era**, 1991 **Adaptive Structures** Robert L. Clark, William R. Saunders, Gary P. Gibbs, 1998-03-31 Mechanical Engineering Materials Science An applications oriented approach for engineers and advanced students Adaptive Structures covers the key concepts and practical issues involved in translating much of the theory of adaptive structures into successful real world hardware Easily applied to a variety of application physics the material emphasizes the integration of control strategies transduction device dynamics and spatial signal processing through novel sensing methods and actuator configurations physical or transformed coordinates The book contains essential models of adaptive structures and components to facilitate design approaches The accompanying disk features script files operating under MATLAB which can be used to generate most of the results presented throughout the book and are invaluable to readers developing their own structural models Topics include Fundamentals of structural dynamics linear systems and signals and signal processing and digital filters The integration of spatial and temporal signal processing techniques Transduction device dynamics and links between physical modal and wave domain models for structural dynamic analysis and control An overview of classical controls An application oriented review of adaptive feedforward control and multivariable feedback control system architectures **Proceedings of the ... ASME Design Engineering Technical Conferences**, 1999 **A Collection of Technical Papers: Structural dynamics**, 1986 Large Space Structures & Systems in the Space Station Era, 1992 **Scientific and Technical Aerospace Reports**, 1991 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database **35th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference**, 1994 **NASA SP.**, 1991 **Introduction to Dynamics and Control of Flexible Structures** John L. Junkins, Youdan Kim, 1993 *Thirty-sixth AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference and AIAA/ASME Adaptive Structures Forum*, 1995 *The 34th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Adaptive Structures Forum: 93-1300 - 93-1369*, 1993 Geodex Structural Information Service Geodex International, 1982 Balanced Control of Flexible Structures Wodek Gawronski, 1996 Methods of structural control and dynamics are introduced in this book These include reduction of large structural models by balanced truncation placement of actuators and sensors for dynamic testing and control structural identification of the minimum order balanced representation balanced dissipative controller design balanced LQG and H controller designs with the closed form relationships between controller parameters and system

performance and controller reduction methods that preserve the closed loop performance The book explores the unique properties of flexible structures to obtain efficient methods of dynamic analysis and controller design The presented methods of structural dynamics identification sensor actuator placement and passive LQG and H controller design have been checked both with simulations and industrial implementations      *Government Reports Announcements & Index* ,1990-11      *Space Station Systems* ,1990

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