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Motion and vibration control is a fundamental technology for the development of advanced mechanical systems such as mechatronics, vehicle systems, robots, spacecraft, and rotating machinery. Often the implementation of high performance, low power consumption designs is only possible with the use of this technology.

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ISBN: 9781402094378 140209437X 9781402094385 1402094388: OCLC Number: 310971470: Description: xi, 378 pages : illustrations ; 25 cm: Contents: Active and Passive Switching Vibration Control with Lyapunov Function, by N. Abe and M. Fujita; Performance Assessment of a Multi-Frequency Controller applied to a Flexible Rotor Magnetic Bearing System - Contact Dynamics, by A. G. Abulrub, M.N .

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Motion and Vibration Control on Apple Books

In this paper, a simple and effective vibration control method is proposed for ultra-precision motion systems with a time-varying performance location based on over-actuation and modal assumption principles, then the controller parameter and actuators' configuration are simultaneously optimized to minimize the H2 norm of vibration magnitudes across all performance locations for optimal global vibration control performance, meanwhile satisfying other mechanical requirements such as ...

Simultaneous optimization of actuators' configuration and ...

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Vibration is a mechanical phenomenon whereby oscillations occur about an equilibrium point.The word comes from Latin vibrationem ("shaking, brandishing"). The oscillations may be periodic, such as the motion of a pendulum—or random, such as the movement of a tire on a gravel road.. Vibration can be desirable: for example, the motion of a tuning fork, the reed in a woodwind instrument or ...

Vibration - Wikipedia

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Motion And Vibration Control Selected Papers From Movic 2008

Passive Vibration and Motion Control; ... It is intended that, for most applications, a mount from the line of standard LORD Shipping Container Mounts can be selected. The basics of shock isolation are presented to give the reader an understanding of the effects of assumptions made during analysis of the system. The relationship of shock ...

Motion and vibration control is a fundamental technology for the development of advanced mechanical systems such as mechatronics, vehicle systems, robots, spacecraft, and rotating machinery. Often the implementation of high performance, low power consumption designs is only possible with the use of this technology. It is also vital to the mitigation of natural hazards for large structures such as high-rise buildings and tall bridges, and to the application of flexible structures such as space stations and satellites. Recent innovations in relevant hardware, sensors, actuators, and software have facilitated new research in this area. This book deals with the interdisciplinary aspects of emerging technologies of motion and vibration control for mechanical, civil and aerospace systems. It covers a broad range of applications (e.g. vehicle dynamics, actuators, rotor dynamics, biologically inspired mechanics, humanoid robot dynamics and control, etc.) and also provides advances in the field of fundamental research e.g. control of fluid/structure integration, nonlinear control theory, etc. Each of the contributors is a recognised specialist in his field, and this gives the book relevance and authority in a wide range of areas.

During the last decades, the growth of micro-electronics has reduced the cost of computing power to a level acceptable to industry and has made possible sophisticated control strategies suitable for many applications. Vibration c- trol is applied to all kinds of engineering systems to obtain the desired dynamic behavior, improved accuracy and increased reliability during operation. In this context, one can think of applications related to the control of structures□ vib- tion isolation, control of vehicle dynamics, noise control, control of machines and mechanisms and control of ?uid-structure-interaction. One could continue with this list for a long time. Research in the ?eld of vibration control is extremely comprehensive. Pr- lems that are typical for vibration control of nonlinear mechanisms and str- tures arise in the ?elds of modeling systems in such a way that the model is suitable for control design, to choose appropriate actuator and sensor locations and to select the actuators and sensors. Theobjective of the Symposium was to present anddiscuss methodsthat contribute to thesolution of such problems and to demonstrate the state of the art inthe ?eld shown by typical examples. The intention was to evaluate the limits of performance that can beachievedby controlling the dynamics, and to point out gaps in present research and give links for areas offuture research.Mainly, it brought together leading experts from quite different areas presenting theirpoints of view.

Underactuated multibody systems are intriguing mechatronic systems, as they posses fewer control inputs than degrees of freedom. Some examples are modern light-weight flexible robots and articulated manipulators with passive joints. This book investigates such underactuated multibody systems from an integrated perspective. This includes all major steps from the modeling of rigid and flexible multibody systems, through nonlinear control theory, to optimal system design. The underlying theories and techniques from these different fields are presented using a self-contained and unified approach and notation system. Subsequently, the book focuses on applications to large multibody systems with multiple degrees of freedom, which require a combination of symbolical and numerical procedures. Finally, an integrated, optimization-based design procedure is proposed, whereby both structural and control design are considered concurrently. Each chapter is supplemented by illustrated examples.

This book presents the recently introduced and already widely referred semi-discretization method for the stability analysis of delayed dynamical systems. Delay differential equations often come up in different fields of engineering, like feedback control systems, machine tool vibrations, balancing/stabilization with reflex delay. The behavior of such systems is often counter-intuitive and closed form analytical formulas can rarely be given even for the linear stability conditions. If parametric excitation is coupled with the delay effect, then the governing equation is a delay differential equation with time periodic coefficients, and the stability properties are even more intriguing. The semi-discretization method is a simple but efficient method that is based on the discretization with respect to the delayed term and the periodic coefficients only. The method can effectively be used to construct stability diagrams in the space of system parameters.

Based on many years of research and teaching, this book brings together all the important topics in linear vibration theory, including failure models, kinematics and modeling, unstable vibrating systems, rotordynamics, model reduction methods, and finite element methods utilizing truss, beam, membrane and solid elements. It also explores in detail active vibration control, instability and modal analysis. The book provides the modeling skills and knowledge required for modern engineering practice, plus the tools needed to identify, formulate and solve engineering problems effectively.

spatial discretization of the flexible link deflections. A convergence study is presented to evaluate the appropriateness of the spatial approximating functions and to determine the number of modes required for obtaining accurate simulation results.

Intelligent Vibration Control in Civil Engineering Structures provides readers with an all-encompassing view of the theoretical studies, design methods, real-world implementations, and applications relevant to the topic The book focuses on design and property tests on different intelligent control devices, innovative control strategies, analysis examples for structures with intelligent control devices, and designs and tests for intelligent controllers. Focuses on the principles, methods, and applications of intelligent vibration control in civil engineering Covers intelligent control, including active and semi-active control Includes comprehensive contents, such as design and properties of different intelligent control devices, control strategies, and dynamic analysis, intelligent controller design, numerical examples, and experimental data

This book is a companion text to Active Control of Sound by P.A. Nelson and S.J. Elliott, also published by Academic Press. It summarizes the principles underlying active vibration control and its practical applications by combining material from vibrations, mechanics, signal processing, acoustics, and control theory. The emphasis of the book is on the active control of waves in structures, the active isolation of vibrations, the use of distributed strain actuators and sensors, and the active control of structurally radiated sound. The feedforward control of deterministic disturbances, the active control of structural waves and the active isolation of vibrations are covered in detail, as well as the more conventional work on modal feedback. The principles of the transducers used as actuateors and sensors for such control strategies are also given an in-depth description. The reader will find particularly interesting the two chapters on the active control of sound radiation from structures: active structural acoustic control. The reason for controlling high frequency vibration is often to prevent sound radiation, and the principles and practical application of such techniques are presented here for both plates and cylinders. The volume is written in textbook style and is aimed at students, practicing engineers, and researchers. Combines material from vibrations, signal processing, mechanics, and controls Summarizes new research in the field

Given the advantages of parallel manipulators and lightweight manipulators, a 3-PRR planar parallel manipulator with three lightweight intermediate links has been developed to provide an alternative high-speed pick-and-place positioning mechanism to serial architecture manipulators in electronic manufacturing, such as X-Y tables or gantry robots. Lightweight members are more likely to exhibit structural defection and vibrate due to the inertial forces from high speed motion, and external forces from actuators. Structural flexibility effects are much more pronounced at high operational speeds and accelerations. Therefore, this thesis presents the dynamics and vibration control of a 3-PRR parallel manipulator with three flexible links.Secondly, this thesis presents the investigation on dynamic stiffening and buckling of the flexible links of a 3-PRR parallel manipulator by including the effect of ii longitudinal forces on the modal characteristics. Natural frequencies of bending vibration of the intermediate links are derived as the functions of axial force and rigid-body motion of the manipulator. Dynamic stiffening and buckling of intermediate links is investigated and configuration-dependent frequencies are analyzed. Furthermore, using Lagrange multipliers, the fully coupled equations of motions of the flexible parallel manipulator are developed by incorporating the rigid body motions with elastic motions. The mutual dependence of elastic deformations and rigid body motions are investigated from the analysis of the derived equations of motion. Open-loop simulation without joint motion controls and closed-loop simulation with joint motion controls are performed to illustrate the effect of elastic motion on rigid body motions and the coupling effect amongst flexible links. These analyses and results provide valuable insight into the design and control of the parallel manipulator with flexible intermediate links.Thirdly, an active vibration control strategy is developed for a moving 3-PRR parallel manipulator with flexible links, each of which is equipped with multiple PZT control pairs. The active vibration controllers are designed using the modal strain rate feedback (MSRF). The amplification behavior of high modes is addressed, and the control gain selection strategy for high modes is developed through modifying the IMSC method. The filters are developed for the on-line estimation of modal coordinates and modal velocity. The second compensator is used to cut off the amplified noises and unmodeled dynamics due to the differentiation operation in the developed controller. The modal coupling behavior of intermediate links is examined with the modal analysis of vibrations measured by the PZT sensors. The error estimation of the moving platform is examined using the measurement of PZT sensors.Finally, an active vibration control experimental system is built to implement the active vibration control of a moving 3-PRR parallel manipulator with three flexible links. The smart structures are built through mounting three PZT control pairs to each intermediate flexible link. The active vibration control system is set up using National Instruments LabVIEW Real-Time Module. Active vibration control experiments are conducted for the manipulator moving with high-speed, and experimental results demonstrate that the vibration of each link is significantly reduced.Firstly, a procedure for the generation of dynamic equations for a 3-PRR parallel manipulator with three flexible intermediate links is presented based on the assumed mode method. The dynamic equations of the parallel manipulator with three flexible intermediate links are developed using pinned-pinned boundary conditions. Experimental modal tests are performed using an impact hammer and an accelerometer to identify the mode shapes, frequencies, and damping ratios of flexible intermediate links. The mode shapes and frequencies, obtained from experimental modal tests, match very well the assumed mode shapes and frequencies obtained based on pinned-pinned boundary conditions, and therefore the dynamic model developed is validated.

Edited by Takashi Yamaguchi, Mitsuo Hirate, and Chee Khiang Pang, with contributions from pioneers known for their ground-breaking work, High-Speed Precision Motion Control discusses high-precision and fast servo controls in hard disk drives (HDDs). The chapter authors describe the control technologies they've developed, most of which have already been successfully applied to mass production of HDDs. As the proposed methodologies have been verified on commercial HDDs at the very least, these advanced control technologies can also be readily applied to precision motion control of other mechatronic systems, e.g., scanners, micro-positioners, photocopiers, atomic force microscopes (AFMs), etc. Each self-contained chapter progresses from concept to technique and presents application examples in automotive, aerospace, aeronautical, and manufacturing engineering. The control technologies are categorized into high-speed servo control, precision control, and environment-friendly control, making it easy to find an appropriate control technology according to their domain of application. The book also makes MATLAB®/SIMULINK® codes for benchmark problems available for download. The control technologies described range from fundamental classical control theories to advanced topics such as multi-rate control. The content contains a healthy balance between materials from the contributor's research works and that in the wider literature. The resulting resource empowers engineers and managers with the knowledge and know-how to make important decisions and policies.

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