engineering practice when designing and testing a novel smart damping system. Hence sound mathematical modelling is balanced by large sections on experimental implementation as well as case studies, where a variety of automotive applications are described, covering different applications of ride control, namely semi-active suspensions for a saloon car, seat suspensions for vehicles not equipped with a primary suspension and control of heavy-vehicle dynamic tyre loads to reduce road damage and improve handling.

Within the book issues such as road holding, passenger comfort and human body response to vibration are thoroughly analysed. Appropriate control-oriented dampers models are described, along with their experimental validation. Vehicle ride and human body models are illustrated and robust algorithms are designed.

The book is centered around two types of semi-active dampers: friction dampers and magnetorheological dampers. The former can be viewed as an out-of-the-box non-conventional damper while the latter can be thought as a conventional controllable damper (it is used in several cars). Based on these two types of dampers in the course of the book it is shown how to design a semi-active damping system (using a friction damper) and how to implement an effective semi-active control system on a well-established damper (the magnetorheological damper).

The book can be fruitful reading for mechanical engineering students (at both undergraduate and postgraduate level) interested in vehicle dynamics, electrical and control engineering students majoring in electromechanical and electrohydraulic control systems. It should be valuable reading for R&D and design engineers working in the automotive industry and automotive consultants. It can be of interest also to engineers, physicists and applied mathematicians working in the broad area of noise and vibration control, as many concepts can potentially be applied to other fields of vibration control.

The book is structured as follows:

Chapter 1 is a general introduction to active, semi-active and passive suspensions and introduces the fundamental concepts of vehicle ride and handling dynamics.

Chapter 2 focusses on dampers modelling (including hysteresis modelling) and reviews the main vehicle ride and road surface models.

Chapter 3 analyses the human body response to vibration via appropriate human body models based on recent studies in the field of biomechanics.

Chapter 4 is dedicated to control algorithms. After a brief qualitative overview of the fundamentals of modern control theory, the main semi-active suspensions algorithms are introduced. The focus is on an algorithm known as balance logic, which is analysed from a mathematical viewpoint. Emphasis is also placed on robust algorithm design and on techniques to increase the reliability of the systems (*e.g.*, anti-chattering algorithms).

Chapter 5 details the design of a semi-active suspension system based on a friction damper.

Chapter 6 illustrates the design of a magnetorheological-based semi-active suspension.

Chapter 7 offers a comprehensive overview of the applications with a number of case studies including a friction damper-based suspension unit for a saloon car, a magnetorheological damper-based seat suspension for vehicles not equipped with

primary suspensions which uniquely rely on this suspension mounted underneath the driver seat to provide ride comfort and semi-active suspension for heavy vehicles where the emphasis is not only on ride comfort but also on road damage reduction.

Disclaimer

All the experimental work and numerical simulations presented in this book are the result of academic research carried out at the University of Bath (UK) and at the Institute of Solid Mechanics of the Romanian Academy (Romania). All devices described in the book are purely experimental prototypes.

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