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Book Review

Selected Topics in Vibrational Mechanics, I.I. Blekhman. World Scientific Publishing Co. Pvt. Ltd., Singapore (2004). (xxi + 414pp., Price US$92, £56), ISBN:981-238-055-8

Vibrational mechanics is an area that is inhabited by engineers, physicists, mathematicians and others. The pendulum, that is most fundamental of all physical problems, belongs to this subject. Many careers have been made and many glittering prizes awarded for work here that has later been shown to be applicable to many problems in other areas.

In the last few decades, the subject has been given an enormous lease of life when methods from nonlinear dynamics have been applied to problems in this area previously considered to be too difficult.

The attraction of the subject is not hard to appreciate. Geometric nonlinearities, in combination with Newton's laws of motion, lead to equations that are relatively simple to state. Several different theoretical approaches are available to tackle these equations and numerical methods are also available. Added to this, experiments can usually be performed on a laboratory scale with repeatable results. Indeed so fundamental is this area that many theoretical methods usually considered nowadays as mathematical, were developed first in vibrational mechanics.

One of the early, most widely used, approaches has been that of two-timing (a special case of the method of multiple scales). Here the dynamics is divided into two parts: one corresponding to motion on a fast time scale, the other on a slow time scale. This perturbation method (which relies on the existence of some small parameter in the problem) has had almost universal application in vibrational mechanics and elsewhere.

The book under review is an attempt to give this method a more complete mathematical basis and to show its wide applicability. Unfortunately, the book fails on many accounts. Despite claiming to be the work of 'well-known scientists from Germany, Denmark and Russia', in fact it centres on the work of I.I. Blekhman (14 out of the 20 chapters are either authored or co-authored by him). Most of the chapters are self-contained and consist of a fairly constant recipe of presentation with virtually no reference to experiments.

Presentation is very poor. Errors within chapters (including in the titles) extend even to the names such as Reynolds (spelt 'Reinolds') and inconsistencies between chapters abound with some chapters having a different typeface from others.

Overall the book is hard to read (perhaps due to a poor translation) and what is learnt at the end is of little interest. Of course fast–slow methods are important but establishing their mathematical basis has been done better elsewhere (e.g. Multiple Scale and Singular Perturbation Methods by J.K. Kevorkian and J.D. Cole, Springer, 1996).

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