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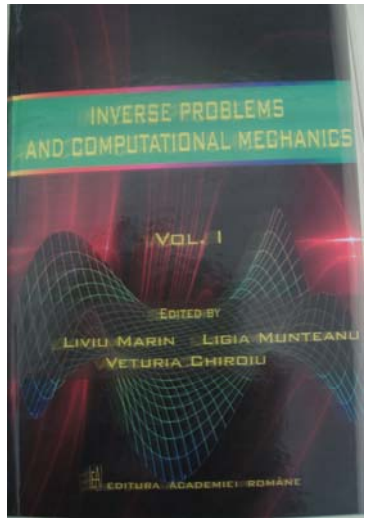

INVERSE PROBLEMS AND COMPUTATIONAL MECHANICS Vol. I

Editors: Liviu MARIN, Ligia MUNTEANU, Veturia CHIROIU
Editura Academiei Române, Bucureşti, 2011

About two years ago I have presented here a similar issue, *Research trends in mechanics*, Vol. 4, Editors: Ligia Munteanu, Veturia Chiroiu, Tudor Sireteanu. Behold that the same idea, of collective volumes published in a prestigious Publishing House, proves to be fertile.
These volumes gather together, in a unitary theme, recent work signed by researchers of recognized value in the country and abroad. A guarantee of high quality of this volume derives from the presence of a Scientific Committee on the cover page, from which I mention: Acad. Dorel Barnabic, Prof. P. P. Delsanto, from Politecnico di Torino, Prof. D. Lesnic, from University of Leeds, Prof. H. Power, from University of Nottingham, Acad. P. P. Teodorescu, Prof. T. Sireteanu, from Romanian Academy, Prof. C. Vallée, from Université de Poitiers. A word about Editors. They are reputed scientists at Institute of Solid Mechanics, Romanian Academy (IMSAR), which continue an earlier initiative, thus succeeding to publish, over the past ten years, no less than twelve collective volumes.

The book, the first one that belongs to a new series, is devoted to the research area of inverse problems and related computational procedures. The volume mainly collects papers of the IMSAR researchers, but also some contributions written by members of universities and research institutes from Romania and abroad.

In fact, the key word of the volume is the syntagm "inverse problems". Philosophically, a direct formulation of a problem consists of determining the effect of a given cause, whilst in inverse formulations the situation is reversed. So, again philosophically speaking, the question is whether the cause determines the effect (direct problems) or to what extent the effect determines some cause (inverse problems). The encyclopedias illustrate as standard inverse problem that posed by the founder of this field of the physical-mathematical thinking, Viktor Ambartsumian: given a family of eigenvalues, is it possible to find the form of the equations whose eigenvalues they are? (see http://www.quora.com/Inverse-Problems).

Let us shortly introduce the volume mentioned in the title of this review. The volume collection consists of seventeen chapters. Here are some of them: *Inverse problems in diffusion*, by B. Brown and D. Lesnic; *Inverse problems in the hysteresis modeling,* by I. Girip, Ligia Munteanu and A. Gozzi*; An inverse problem associated with the Bouc-Wen model,* by M. Ionescu, T. Sireteanu, Veturia Chiroiu and P. P. Teodorescu, *The Method of Fundamental Solution (MFS) for inverse geometric problems*, by A. Karagheorghis, D. Lesnic and L. Marin, *Formulation of inverse problems in sonoelasticity*, by Mihaela Alexandra Popescu, Stefania Donescu and Migdonia Georgescu, *Robot redundancy*

resolution considering obstacle avoidance and kinematic cost function minimization, by C. Secara and D. N. Dumitriu, *Adaptive control of uncertain systems*, by I. Ursu, A. Toader, S. S. Radnef and E. Popa.

I quote from the preface written by Editors: "*This book is both an advanced reference book for experts in the fields of inverse problems and computational methods and an introductory material for researchers with expertise in applied mathematics and mechanics…*"

I want to point out with another quote from this book: "*Inverse problems are typically ill-posed in the sense of Hadamard, as opposed to the well-posed problems where the model parameters or material properties are known. This means that the solution of the inverse problem does not exist, is non-unique, or does not depend continuously in the data*" (Carmen Bucur, A. Popa, C. Rugina).

And finally, one last observation taken from this book, finding that it summarizes a view of the undersigned: "*Much closer to the subject of this book is the specification that an inverse problem is a general framework that is used to convert observed measurements into information about a physical object or system that we are interested in. Our interest on a system focuses from automatic control perspective. Classically, this discipline supposes firstly the system modeling and, secondly, based on this model, the design of a soft system, the controller, that will cause this system to behave in the desired manner. The lessons derived from the conservativeness of the mathematical theories of the classical control versus the mathematical models of the systems confirm the excessive and often inefficient dependency of the theory to mathematical model (and vice versa!) in the sixty years history of classical control*".

I emphasize once again the positive lesson offered by the performance of the IMSAR Editors – that of perseverance and seriousness in achieving the intended purpose.

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