

Preface

This book will present recent developments and discoveries in the vital areas of nonlinear science and complexity, to stimulate more research, and to rapidly pass such discoveries to our community. The materials presented in this book include: nonlinear dynamical systems, Lie group analysis and applications, nonlinear fluid mechanics, celestial mechanics, fractional dynamics and applications, mathematic modeling in engineering complexity for a better understanding of physical mechanism and mathematical theory of complex nature and systems.

This book is based on the 2nd Conference on Nonlinear Science and Complexity, NSC'08, that took place at Porto, Portugal, during 28–31 July 2008. This conference succeeds the NSC'06 held at Beijing, China, during 6–12 August 2006. The aim of the conference was to present the fundamental and frontier theories and techniques for modern science and technology, and to stimulate more research interest for exploration of nonlinear science and complexity. The conference focused also on principles, analytical and symbolic approaches, computational techniques in nonlinear physical science and nonlinear mathematics. After peer-reviewed, 105 papers were accepted for presentations from 30 countries. Later 49 papers were selected for publication in the edited book, divided into five groups. The selected manuscripts were further improved and the edited book represents a valuable contribution to the field of nonlinear science and complexity.

- The topic on nonlinear dynamical systems with thirteen papers presents multiple system synchronization, gear transmission systems, cutting dynamics in material process, fuzzy and stochastic dynamical systems, discontinuous systems, scattered in Parts I and VIII.
- The topic on Lie group analysis and application plays an important role in searching closed-form solutions for nonlinear ordinary and partial differential equations. Six papers are selected for publication in Part II of the edited book.
- The topic on nonlinear dynamics of celestial mechanics presented the basic theory and methods in the field. Nine papers are selected for publications in Part III of the book. The interesting results will be useful to scientists in astronomy.
- The topic on mathematical modeling for nonlinear systems in science and engineering is arranged in Parts IV and V with eleven papers. The Bose-Einstein

condensates, boundary layers, incomplete markets and pneumatic systems are presented.

- The topic on fractional dynamics and computational techniques presents the recent development of fractional calculus and numerical computations. In this group, ten papers are selected for publication in Parts VI and VII.

The editors believe that the edited book presents the recent developments and discoveries in nonlinear science and complexity. The materials in this edited book provide important information and tools for students and scientists in the community of nonlinear science and complexity.

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