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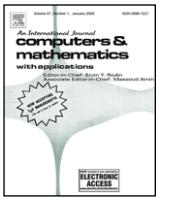

Preface
Special issue of computers and mathematics with applications on fractional differentiation and its applications

This special issue brings together the updated versions of 34 (selected from a total of 150) papers presented at the Third IFAC Workshop on Fractional Differentiation and its Application, Ankara, Turkey, 05–07 November, 2008. These papers span a broad spectrum of fractional calculus and its applications and represent some of the very best work in this field across the world.

In recent years, fractional differentiation has drawn increasing attention in the study of so-called "anomalous" social and physical behaviors, where scaling power law of fractional order appears universal as an empirical description of such complex phenomena. It is worth noting that the standard mathematical models of integer-order derivatives, including nonlinear models, do not work adequately in many cases where power law is clearly observed. To accurately reflect the non-local, frequency- and history-dependent properties of power law phenomena, some alternative modeling tools have to be introduced, such as fractional calculus.

Research in fractional differentiation is inherently multi-disciplinary, and their applications are across diverse disciplines such as physics, chemistry, biology, polymer, medicine, mechanics, finance, social sciences, and, notably, control theory and signal and image processing. This is well reflected by the wide scope of the articles contained in this special issue. Our hope is that this special issue will provide the reader with a broad overview of the state of the art on fractional systems, leading not only to new understandings and progress, but also to the cross-fertilization of new research on theoretical, experimental and computational fronts for potential uses in diverse applications.

Last but not least, the guest editors are very grateful to the editor-in-chief, Prof. Ervin Y. Rodin, for his kind support on the publication of this special issue. We also thank the sponsors of FDA08, namely Cankaya University represented by the President of the Board of Trustees SıtkıAlp and the Rector Professor Ziya B. Güvenc, TUBITAK (The Scientific and Technological Research Council of Turkey), and the IFAC, for providing the resources needed to hold this workshop.

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