Editorial

Propagation Phenomena and Transitions in Complex Systems 2012

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An increasing challenge in advanced engineering applications based on efficient mathematical models for propagation and transition phenomena can be noticed nowadays. Fractal theory and special mathematical functions are used in modeling very small-scale material properties (energy levels and induced transitions) for the design of nanostructures. Differential geometry is adapted for solving nonlinear partial differential equations with very great number of variables for modeling dynamics and transitions in complex optoelectronics systems. Propagation aspects implying commutative and/or additive consequences of quantum physics are used extensively in the design of long-range transmission systems. Time series with extremely high-transmission rates are used for multiplexed transmission systems for large communities, such as traffic in computer networks or transportation, financial time series, and time series of fractional order in general. All these advanced engineering subjects require efficient mathematical models in the development of classical tools for complex systems. The objective in such applications is to take into consideration efficiency aspects of mathematical and physical models required by basic phenomena of propagation and transitions in complex systems, when specific limitations are involved (very long distance propagation phenomena, fractal aspects and transitions in nanostructures, and complex systems with great number of variables and infinite spatiotemporal extension of material media). Using advanced mathematical tools for modeling propagation and transition phenomena, this special issue presents high qualitative and innovative developments for efficient mathematical approaches of propagation phenomena and transitions in complex
systems. Significant results were obtained in the research fields of low-scale physical structures, propagation of waves in advanced materials, dynamics of complex systems, and efficient signal and image analysis based on fundamental mathematical and physical laws.

This special issue involves 19 original papers, selected by the editors so as to present the most significant results in the previously mentioned topics. These papers are organised as follows:


(e) Two papers on efficient image analysis based on fundamental mathematical and physical laws: “Kernel optimization for blind motion deblurring with image edge prior” by J. Wang, K. Lu, Q. Wang, and J. Jia, and “Power-law properties of human view and reply behavior in online society” by Y. Wu, Q. Ye, J. Xiao, and L. Li.

(f) Two papers on scaling and optimization aspects: “Kernel optimization for blind motion deblurring with image edge prior” by F. Pop, and “Study of the fractal and multifractal scaling intervening in the description of fracture experimental data reported by the classical work” by C. L. Violeta and D. Iordache.
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