

## GUEST EDITORIAL PREFACE

# Special Issue on Advanced Tools and Techniques for Complexity Sciences (Part 1)

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The recent technological progress leads to an increased complexity in many natural and artificial systems. This increase in complexity is a result of the emergence of new properties and spatio temporal interactions among a large number of system elements and between the system and its environment. In the last years, rapid advances in high performance computing have created a revolution in the scientific understanding of complex systems. Data-mining, modeling and computational intelligence are tools and techniques most used in complexity sciences.

The articles for this special issue were selected from the papers presented at to the Second World Conference on Complex Systems (WCCS), which took place on November 10-12, 2014 in Agadir-Morocco. WCCS technically sponsored by IEEE and “International Academy for Systems and Cybernetic Science” attracted over 163 researchers from 20 countries around the world. From 351 submissions 130 were selected as full papers and 33 as posters. We have invited eight authors to submit extended versions of their papers to this two-part special issue. Each of these was reviewed and assessed on the overall quality of the submitted work compared to the original WCCS paper. The main objective of this special issue is to provide researchers with tools and techniques for handling many features of the complexity from several viewpoints and different tools and techniques.

SFA et al. in the first article “A Theoretical Learning Model Combining Stochastic Cellular automata and Economic Indicators to Simulate Land use Change” propose an original learning model coupling stochastic Cellular Automata and economic indicators to simulate the land use change. This model is an important step in building an “environmental virtual laboratory” in order to inform spatial planners and policy makers of the possible developments they face in order to optimize future management decisions.

The second article “A Co-evolution Analysis for Software Product Lines: an Approach Based on Evolutionary Trees” by Benlarabi et al. analyze the coevolution of the common platform and the products of a software product line. The motivation for this work was the increasing orientation towards reuse in software development. Software product line engineering is a widespread reuse paradigm which recorded a meaningful gain in terms of time to market and costs, but also certain gaps related to product lines evolution. Thus, the paper focuses on the change propagation within software product lines in order to identify the hidden failures in the change impact analysis and to correct them. A comparative study of the evolution histories of the platform and the products was conducted using biological techniques, and a mathematical processing was proposed to detect and correct the divergences. The results obtained by the proposed analysis were validated through an experiment on Mobile Media software product line.

Assas in the third article “Improvement of 2-Partition Entropy Approach Using Type-2 Fuzzy Sets for Image Thresholding” propose the fuzzy 2-partition using type-2 fuzzy logic with new membership functions to represent the imprecision or lack of knowledge of the expert in the choice of the membership function associated with the image. Two databases are used to evaluate its effectiveness: dataset of standard grayscale test images and MR Brain images. The original image is segmented in two parts (background and object). In order to judge the quality of the results provided by the proposed approach, Peak signal to noise ratio (PSNR) is used to determine the quality of the thresholded image. Experiment results show that the type-2 Fuzzy 2-partition entropy algorithm performs equally well in terms of the quality of image segmentation and leads to a good visual result. The fuzzy thresholding depends on the type of images, the upper and lower membership degrees of membership function and the linguistic hedges parameter used.

The fourth article “What Issues of Literary Analysis Can Differential Equations Clarify?” by Zhuravlev et al. investigate to what extent differential equations can describe the dynamics of love relations in two masochistic love plots featuring in *Venus in Furs* (1869) by Leopold von Sacher-Masoch and Ivan Turgenev’s *Torrents of Spring* (1872). Aim of study was to connect the models with the ideas and methods of literary criticism. The work was motivated by various attempts to apply mathematics to the analysis of plots in fiction. Love/seduction plots are to be found in a great number of novels and tales and, at the same time, they appear to be most challenging. The structuring of love plots in fiction corresponds to the specific artistic strategy and philosophy of the writer. The results of research prove that certain types of love plots can only be related to certain systems of differential equations and make clear the correlation between specific mathematical models and the characteristic features of different types of love stories.

In this two-part special issue, the articles presented provide interesting viewpoints and perspectives regarding current advanced tools and techniques in complexity sciences. As guest editors, we would like to thank all the authors who submitted their papers to this special issue. We really appreciate the efforts of the contributors and reviewers. We are also very grateful to the WCCS keynote speakers, Matjaz Mulej, Pierre Bricage, Nigel Gilbert, Hans Van Vliet, and Alain Abran. Finally I would like to express my gratitude to the Professor Wei-Chiang Samuelson editor-in-chief of International Journal of Applied Evolutionary Computation (IJAEC) for accepting our invitation to publish the best papers of WCCS and for giving the authors the opportunity to present their work in IJAEC.

We hope that readers can benefit from the work presented in this special issue and will contribute to this growing research area.

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