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Guest-Editorial

Special Issue on Computational Models for Life Sciences

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This special issue consists of five papers selected from the *First International Symposium on Computational Models for Life Sciences* (CMLS'07) held on the Gold Coast of Australia in December 2007. These papers were extended, reviewed and revised for final acceptance. These papers are selected for publications in the *International Journal of Intelligent Hybrid Systems* based on their quality, relevance and advancement in the field of intelligent systems for the life sciences.

The paper by Oyama-Higa et al. entitled "Relationship between fractal dimension and favorability of facial imagery" reports interesting results on using fractal analysis of human faces for quantifying the complexity of human psychological processes and cognitive functions. The authors have found a strong correlation between the degree of facially expressed agreeability and fractal dimensions. Experiment results suggest an interesting finding that that fractal dimensions are higher for smiling than for expressionless faces. This research will certainly attract the attention of many researchers in the interdisciplinary fields of science and engineering in developing computerized intelligent systems for understanding human perception and expressions.

This study will certainly be useful for training machines in learning how to assist aging or disabled people in particular tasks.

The work by Yu et al. entitled "Image processing and reconstruction of cultured neuron skeletons" investigates an important problem in neural imaging. A novel contribution of this paper is the development of a method for extracting and reconstructing neural skeletons that are subject to low contrast and noisy background.

This approach introduces several algorithms including the segmentation of neural cell images using logical thresholding of grey levels, the reconstruction of cultured neuron skeleton using prior knowledge and extension analysis. It also presents methods for filling holes, smoothing and extracting new skeletons. Using a reconstructed skeleton, its neural length and morphology can be readily quantified. The proposed approach was effectively applied to a series of images obtained from monitoring a live, unstained neuron in culture.

P. Zhang et al. report a new method for protein peak detection using mass spectrometry data in their paper entitled "Peak detection using peak tree approach for mass spectrometry data". Mass spectrometry (MS) is being increasingly used in proteomics research as a high-throughput technique to discover disease biomarkers. An MS spectrum can be described by a set of peaks. Those peaks that allow reliable classification between disease and control samples are considered as biomarkers. This paper presents an algorithm for peak detection based on the concept of a peak tree. Strength of this method is its robustness against spectrum variations and therefore it can produce consistent results among different spectra.

There exist many competitive machining learning methods for pattern classification. It is therefore very

useful to study advantages and disadvantages of different methods utilized for solving particular problems. The paper by B. Zhang and Y. Zhang, entitled "Classification of cerebral palsy gait by kernel fisher discriminant analysis", presents an interesting study on comparative performances of some popular pattern classification methods for gait analysis using cerebral palsy (CP) data. After explaining about the efficiencies of different classifiers for CP gait identification, the authors advocate the kernel Fisher discriminant analysis and particularly show that this method can demonstrate competitive and favorable performance in comparison to the support vector machines.

One of modern mathematical schools of thought for handling uncertainty is rough-set theory. Crossingham and Marwala applied genetic algorithms, particle swarm optimization, hill climbing and simulated annealing for optimizing rough-set partitions, which were then used for predicting human immunodeficiency virus (HIV) and forecasting accuracies on militarized conflicting models. An interesting feature of the proposed approach is the use of a rule-based system generated from rough sets, which can be intuitively represented with linguistic terms.

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