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Editorial

Nonlinear Time Series: Computations and Applications 2012

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Nonlinear time series attracts the interests of scientists and engineers in both research and applications in various fields, ranging from hydrology to computer science. It is a powerful tool for revealing interesting phenomena in natural science and engineering regarding challenging issues in, for instances, fractal random functions, differential equations of fractional order, fractional calculus, prediction of random functions, technologies in denoising for both signals and images, pattern recognition, wavelets, and so forth. The aim of this special issue is to collect high quality papers with respect to nonlinear time series, its computations, and applications. There are 28 papers collected in this special issue in the related topics. We introduce them by six paragraphs below.

A.-J. Shi and J.-G. Lin's paper entitled "*Tail dependence for regularly varying time series*" studies regularly varying time series to describe heavy-tailed phenomena from a view of tail dependence by introducing a dependence function and establishing a relationship between the dependence function and the intensity measure with discussions of their present expressions about dependence parameters. J. Xue et al.'s paper "*Bound maxima as a traffic feature under DDOS flood attacks*" provides a novel method to characterize the traffic features with and without attacking packets. The paper entitled "*A novel fractional-discrete-cosine-transform-based reversible watermarking for healthcare information management systems*" by L.-T. Ko et al. presents a new method of watermarking to reconstruct host images by using the technique of discrete cosine transform of fractional order. I. Cherif et al.'s paper "*Nonlinear*

blind identification with three-dimensional tensor analysis" deals with the blind identification of a second-order Volterra-Hammerstein series using the analysis of three-dimensional tensor. The paper "*Online health management for complex nonlinear systems based on hidden semi-markov model using sequential Monte Carlo methods*" by Q. Liu and M. Dong introduces a new approach of multisteps ahead health recognition based on joint probability distribution for health management of a complex nonlinear system with the technique combining hidden semi-Markov model with sequential Monte Carlo methods. H. Bayiroğlu et al.'s paper "*Nonlinear response of vibrational conveyers with nonideal vibration exciter: superharmonic and subharmonic resonance*" gives the theoretical and numerical analysis of the working ranges of oscillating shaking conveyers with nonideal vibration exciter for superharmonic and subharmonic resonances in multiple scales.

Wavelets remain a powerful tool in nonlinear time series. The paper entitled "*A new texture synthesis algorithm based on wavelet packet tree*" by H. C. Hsin et al. presents an efficient method of texture synthesis with wavelet packet tree, providing a useful technique for investigating the issue of multiresolution representation for fractal images. Y. Huang et al.'s paper "*Minimum-energy multiwavelet frames with arbitrary integer dilation factor*" explains the research of the minimum-energy multiwavelet frame.

J. Yang et al. presented their study in the construction of affine invariant functions in the paper entitled "*Construction of affine invariant functions in spatial domain*", which is satisfactorily used for pattern recognition of Chinese words. The paper "*Adaptive binary arithmetic coder-based image feature and segmentation in the compressed domain*" by H. C. Hsin et al. gives a modification of the compression-based texture merging algorithm to alleviate the influence of overmerging problem by making use of the rate distortion information so that the computational cost because of the segmentation of an image may be reduced considerably. R. Wang and B. Fang's paper "*A combined approach on RBC image segmentation through shape feature extraction*" proposes a combined approach for complex surface segmentation of red blood cell based on the techniques of shape-from-shading and multiscale surface fitting, which is promising for the pattern recognition of red blood cell in the sense of 3-dimensional modeling by taking into account multiscale surface features of red blood cell segments. S. Hu et al. in their paper "*Reducing noises and artifacts simultaneously of low-dosed X-ray computed tomography using bilateral filter weighted by Gaussian filtered sinogram*" proposed an efficient method to obtain satisfied denoising results for sinogram restoration of low-dosed X-ray computed tomography by weighing the similarity using Gaussian smoothed sinogram. The paper entitled "*Image denoising based on dilated singularity prior*" by S. Hu et al. gives an approach to preserve edges and textures in image denoising by adding dilated singularity prior to noisy images. Y.-Y. Zhu et al.'s paper "*Detection and recognition of abnormal running behavior in surveillance video*" gives a method of identifying abnormal running behavior based on spatiotemporal parameters by taking into account real-time systems and multitarget tracking in surveillance videos. The paper entitled "*Data matrix code location based on finder pattern detection and bar code border fitting*" by Q. Huang et al. presents an algorithm for locating data matrix code based on finder pattern detection and bar code border fitting, which has applications to locating a 2D bar code quickly and precisely in an image with complex background, such as poor illumination. B. Chen et al.'s paper "*A multiplicative noise removal approach based on partial differential equation model*" contributes a method of removing speckle noise by introducing a four-order partial differential equation, which may obtain better edge-preserve performance.

Packet-delay analysis gains interests of scientists in computer-network engineering from the point of view of real-time systems in particular as well as applied statistics with

respect to queuing systems driven by fractal arrival time series. D. Pan et al.'s paper entitle "*Buffer management and hybrid probability choice routing for packet delivery in opportunistic networks*" contributes a hybrid probability choice routing protocol with buffer management for opportunistic networks. The authors developed a delivery probability function based on continuous encounter duration time, which is used for selecting a better node to relay packets. By combining the buffer management utility and the delivery probability, they attained a total utility that is used to decide whether the packet should be kept in the buffer or be directly transmitted to the encountering node. H. Wu et al.'s paper "*Location updating schemes for high-speed railway cellular communication systems*" proposes two useful methods regarding location updating, namely, "clustering location management" and "mobile group location management," towards solving the problems caused by the existing location updating schemes in high speed railway cellular private network without occupying more frequency resources and impacting the mobile subscribers' paging. In addition, the paper gives analysis of useful specifications, such as channel request number of stand-alone dedicated control channel, average waiting time of location updating, cost of location updating, and paging. The paper "*Applying semigroup property of enhanced Chebyshev polynomials to anonymous authentication protocol*" by H. Lai et al. presents an anonymous authentication protocol that is efficient in low computational complexity and cost in the initialization phase by using semigroup property of enhanced Chebyshev polynomials. H.-Y. Lin et al. presented a paper entitled "*An adaptive test sheet generation mechanism using genetic algorithm*", where an adaptive test sheet generation is given from a view of time series. That may be the first paper noticing that there may be fractal phenomena, such as statistical self-similarity of genetic algorithm's fitness scores, in the assessment of information provided by computerized testing systems.

The paper entitled "*Hypothesis testing in generalized linear models with functional coefficient autoregressive processes*" by L. Song et al. studies the hypothesis testing in generalized linear models with functional coefficient autoregressive processes by introducing quasi-maximum likelihood estimators. T.-S. Tsay's paper "Automatic regulation time series for industry processes" proposes a nonlinear digital control scheme for analyses and designs of stable industry processes, which can be applied to servo systems, time delay systems, and so on. D. Xiang et al.'s paper "*Degenerate-generalized likelihood ratio test for one-sided composite hypotheses*" gives a method with respect to the degenerate-generalized likelihood ratio test for one-sided composite hypotheses in cases of independent and dependent observations. Their method has less overall expected sample sizes and less relative mean index values in comparison with the sequential probability ratio test and double sequential probability ratio test.

Research of theory and tools of time series prediction is encouraged. The paper by X.-H. Yang and Y.-Q. Li, which is entitled "*DNA optimization threshold autoregressive prediction model and its application in ice condition time series*", presents a new DNA (deoxyribonucleic acid) optimization threshold autoregressive prediction model (DNAOTARPM) by combining threshold autoregressive method with DNA optimization. It may be useful for the calibration of the threshold autoregressive prediction model for nonlinear time series with prediction precision improving and prediction uncertainty reducing. The paper entitled "*Design of deep belief networks for short-term prediction of drought index using data in the Huaihe River Basin*" by J. Chen et al. contributes a short-term drought prediction model based on deep belief networks for predicting the time series at different time scales. Their prediction model has applied to predict the real drought time series in the Huaihe River Basin, China. J.-L. Wu and P.-C. Chang's paper "*A trend-based segmentation method and the support vector regression for financial time series forecasting*" presents a trend-based segmentation method and the support vector

regression for financial time series forecasting. S.-S. Yang et al. in their paper entitled "*New optimal weight combination model for forecasting precipitation*" introduced a new optimal weight combination model to increase accuracies in precipitation forecasting. The present model, which consists of three forecast submodels, namely, rank set pair analysis model, radical basis function model, and autoregressive one, may significantly improve the forecast accuracy of precipitation in terms of the error sum of squares in comparison with the single model of rank set pair analysis, or radical basis function, or autoregressive system.

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