



EDITORIAL

Special Issue on Intelligent Computing for Multimedia Assurance

1. Introduction

Intelligent computing techniques, such as Neural Networks, Fuzzy Logic, Evolutionary Computing, Rough Sets, Chaos and other similar techniques, have been proved effective for various applications. Taking neural network for example, a neural network is a network composed of many simple units, while producing intelligent actions according to certain structure, dynamics and learning method. Till now, neural networks have been widely used in various applications, such as machine vision, pattern detection, data segmentation, data mining, adaptive control, information assurance, etc.

Recently, multimedia (text, image, video, audio, etc.) have come to enrich man's daily life, and its prosperity also attracts malicious attackers and abusers with different motivations, such as political reasons, illegal financial benefits, or simply to win a prestige reputation in a hacker community. The typical example is image forgery, i.e., the original image is tampered maliciously by replacing, cutting, warping, etc. To detect the tempering, various methods have been reported. Among them, intelligent computing based methods obtain better performances in some aspects, which benefit from the intelligent techniques' learning ability. Additionally, intelligent techniques also show some good properties for confidentiality protection, integrity detection, ownership authentication or copy tracing, etc.

This special issue of the Neural Network World Journal invited authors to submit their original work that communicates current research on intelligent computing for multimedia assurance regarding both the novel solutions and future trends in the field. In this special issue, we have 10 papers, which can demonstrate advanced works in the field.

2. The papers in this special issue

The 10 papers can be clustered into 4 groups according to the topics.

2.1 Multimedia content protection based on intelligent computing

The first four papers are about multimedia content protection.

The first paper, “Contents Sharing Scenario Oriented Risk-Controlled Utility Analysis on Enhanced Security Policies for DRM” by Z. Zhang et al., presents a fuzzy risk assessment method for security policies in Digital Rights Management (DRM). To keep the DRM system running in order, risk management should be adopted, which identifies and assesses the DRM system’s security level. In this paper, a qualitative and quantitative fuzzy risk assessment is proposed and used to estimate the security issues in multimedia content sharing. And, an application case of the emerging trusted computing policy is introduced and analyzed, which shows the proposed assessment method’s accuracy.

In the second paper, “A Digital Image Encryption Algorithm Based on DNA Sequence and Multi-Chaotic Maps” by X. Xue et al., an image encryption algorithm based on DNA sequence and multi-chaotic maps is proposed. Firstly, Cubic map and wavelet function are used to produce the 2D chaotic sequences that will be adopted to scramble the location of pixel points from the image. Secondly, the DNA sequence and chaotic sequence produced by Logistic chaotic map is used to disturb the gray of the pixel points from the image. Some experiments are performed to show the proposed algorithm’s security against various attacks.

In the third paper, “Evolutionary Rule Generation for Signature-based Cover Selection Steganography” by H. Sajedi and M. Jamzad, a novel approach for selecting suitable cover images for steganography is presented. In this approach, an evolutionary algorithm is adopted to extract the signature of cover images against stego images. This algorithm is based on an iterative rule learning approach to construct an accurate fuzzy rule base. Then, the fuzzy rules generated in the first stage are used to select suitable cover images for steganography. Various experiments are done to show that a secret message can be securely embedded in cover images selected by the intelligent rule generation approach.

The fourth paper, “Color Image Watermarking Using Regularized Extreme Learning Machine” by W. Deng et al., proposes a real-time image-watermarking scheme based on Regularized Extreme Learning Machine (RELM). Using the information provided by the reference positions, the RELM can be trained at the embedding procedure and watermark is adaptively embedded into the blue channel of the original image by considering the human visual system. Due to the extreme training speed and good generalized performance, the trained RELM can exactly extract the watermark from the watermarked image against image processing attacks within very short time, and this makes this method available for real-time environments.

2.2 Surveillance based on intelligent multimedia computing

The next two papers are about content surveillance.

The fifth paper, “A Two-Stage VoIP SPAM Identification Framework” by G. Ebrahim and A. Younis, introduces a two-stage VoIP SPAM identification framework. The first stage is a pre-call identification process, which uses a set of parameters about the call that can be collected before allowing the call to go through.

The second stage is a post-call identification process that uses other parameters that can be collected during/after the call. Especially, a fuzzy-logic controller is developed to identify VoIP SPAM in the second stage, and an augmented ongoing tuning strategy is adopted to further tune the identification process. Simulation studies are carried out to demonstrate the effectiveness of the two-stage approach in identifying VoIP SPAM.

In the sixth paper, “3D Object Recognition Using Octree Model and Fast Search Algorithm” by Y. Lee et al., a new approach to 3D object recognition by using an Octree model library (OML) and fast search algorithm is proposed. Firstly, the method is based on matching the object contour to the reference occluded shapes of 49, 118 viewing directions. The initially best-matched viewing direction is calibrated by searching for the 4 pairs of feature points between the input image and the image projected along the estimated viewing direction. Secondly, the fast search algorithm is used for finding the 4 pairs of feature points to estimate the viewing direction uses on effective two level database. The analysis and experiments show that the proposed approach gets good performances in computational cost and recognition accuracy.

2.3 Biometrics based on intelligent multimedia analysis

The next two papers are about biometrics.

The seventh paper, “Improvement of Authorship Invarianceness for Individuality Representation in Writer Identification” by A. Muda et al., proposes a method to improve the writer’s identification. This method transforms the various representations into a better representation of individual features, which lies between the two steps of feature extraction and classification. Since this method reduces the features’ dimensions, it is expected to improve the classification performance. Some experiments are carried out to demonstrate performance improvement.

The eighth paper, “Transiently Chaotic Associative Network based Fingerprint Image Analysis” by K. Ahmadian and M. Gavrilova, presents a technique for fingerprint image matching in biometric security applications. This technique is based on the hybrid of Neural Network and Delaunay Triangulation methodology. The Delaunay triangulation of the minutiae set is transformed to a set of points in the discretized space using duality. Then, the Transiently Chaotic Associative Network (TCAN) is used to learn the obtained pattern. Experimental results show some performance improvements compared with traditional methods.

2.4 Computer-aided medical based on intelligent multimedia analysis

The final two papers are about computer-aided medical applications.

In the ninth paper, “Extracting Fascia and Analysis of Muscles from Ultrasound Images with FCM-based Quantization Technology” by K. Kim, a novel method is proposed to measure the muscle thickness from ultrasound images of the lumbar region in order to diagnose low back pain effectively. The Fuzzy C-Means (FCM) based quantization is used to extract fascia from ultrasound images. The FCM quantizer first analyzes the distribution of intensity from images and then makes

clusters of similar intensity based on the distance from the center point. Experimental results show that the proposed method is sufficiently competitive with that of human experts, and can be used for an auxiliary computer-aided system.

In the last paper, “Improved Fuzzy Clustering Segmentation for Medical Images” by S. Kannan et al., some effective robust fuzzy c-means methods are proposed for segmenting Brain Medical Images and Dynamic Contrast-Enhanced Breast Magnetic Images. The segmentation is a challenging problem in the brain and breast medical images for diagnosing Breast and Brain cancer related diseases. This paper presents some segmentation methods based on spatial information and weight bias estimation. Various experiments are done to compare the proposed methods with existing methods. The results show that the proposed algorithms have better performance in segmentation accuracy than the existing ones.

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