

## EDITORIAL PREFACE

# Special Issue on Soft Computing Techniques for Image Processing

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The second issue for 2013 of the *International Journal of System Dynamics Applications* (IJSDA) covers a lot of topics in Soft Computing Techniques for Image Processing. It contains five regular papers.

The first paper by Zhou et al. presents a distributed algorithm that coordinates a team of autonomous mobile robots to explore an unknown environment. The proposed strategy is based on frontiers which are the regions on the boundary between open and unexplored space. With this strategy, robots are guided to move constantly to the nearest frontier to reduce the size of unknown region. Based on the Particle Swarm Optimization (PSO) model incorporated in the algorithm, robots are navigated towards remote frontier after exploring the local area. The exploration completes when there is no frontier cell in the environment. The experiments implemented on both simulated and real robot

scenarios show that the proposed algorithm is capable of completing the exploration task. Compared to the conventional method of randomly selecting frontier, the proposed algorithm proves its efficiency by the decreased 60% exploration time at least. Additional experimental results show the decreased coverage time when the number of robots increases, which further suggests the validity, efficiency and scalability.

The second paper by El-said SA presents a Reliable Face Recognition System (RFRS). In the proposed RFRS system, for the first time up to our knowledge, a combination of Gabor Filter (GF), Principal component analysis (PCA) for efficient feature extraction, and ANN for classification is employed. It allows the detection of faces in cluttered images besides extracting the face images features efficiently. Specifically, it demonstrates how to detect faces in noisy images by training the network

several times on various input; ideal and noisy images of faces. Applying GF before PCA reduces PCA sensitivity to noise and provides a greater level of invariance, while training the ANN on different sets of noisy images forced the network to learn how to deal with noise; a common problem in the real world. The output of the ANN is a vector whose length equal to the distinct subjects in Olivetti Research Laboratory (ORL). The ANN is trained to output a 1 in the correct position of the output vector and to fill the rest of the output vector with 0's. Experimentation is carried out on RFRS by using ORL datasets. The experimental results show that training the network on noisy input images of face greatly reduce its errors when it had to classify or to recognize noisy images. For noisy face images, the network did not make any errors for faces with noise of mean 0.00 or 0.05. The average recognition rate of noisy face images varies from 96.8% to 98%. When noise of mean 0.10 is added to the images the network begins to make errors. For noiseless face images, the proposed system achieves correct classification. The results show the feasibility of the methodology followed in this paper. Performance comparison between RFRS and other face recognition techniques shows that for most of the cases, RFRS performs better than other conventional techniques under different types of noises and it shows the high robustness of the proposed algorithm.

In the sequel, the paper by Liu et al. investigates image features and their relationships by analogy with Taylor expansion. The kind of expansion could be helpful for analyzing image feature and engraftment, such as transferring color between images. By analogy with Taylor expansion, the image color transfer algorithm is designed by the first and second-order information. The luminance histogram represents the first-order information of image, and the co-occurrence matrix represents the second-order information of image. Some results illustrate

the proposed algorithm is effective. In this study, each polynomial in the Taylor analogy expansion of images is considered as one of image features which help in re-understanding images and its features. By using the proposed technique, the features of image, such as color, texture, dimension, time series, would be not isolated but mutual relational based on image expansion.

The fourth paper by Waheed et al. involves an approach to multi-channel blind de-convolution, which uses an adaptive filter that performs blind source separation in the Fourier space. The approach keeps (during the learning process) the same permutation and provides appropriate scaling of components for all frequency bins in the frequency space. Experiments indicate that Generalized Laplace Distribution can be used effectively to blind de-convolution of convolution mixtures of sources in Fourier space compared to the conventional Laplacian and Gaussian function.

Finally, Abdel Alim et al. in the last paper of IJSDA V2, N2, propose a pattern recognition module that makes use of 3-D images of objects. The proposed module takes advantage of both the generalization capability of neural networks and the possibility of manipulating 3-D images to generate views at different poses of the object that is to be recognized. This allows the construction of a robust 3-D object recognition module that can find use in various applications including military, biomedical and mine detection applications. The paper presents an efficient training procedure and decision making strategy for the suggested neural network. Sample results of testing the module on 3-D images of several objects are also included along with an insightful discussion of the implications of the results.

As guest editors, we hope that the papers in this issue will stimulate further research in soft computing techniques for image process-

ing. We hope that this issue, covering so many different aspects, will be of value for all readers.

We would like to thank all authors and reviewers for their invaluable work and we are sure that the increasing interest for this journal will attract many more important research papers. We think that the quality has reached a certain level but we should not be satisfied with only this fact. To this end, we emphasize again that we need your help by submitting high quality research papers citing works already published

in this journal. Your high quality comments and research reports are always more than welcome and very helpful to meet our targets.

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