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SPECIAL ISSUE ON SOFT COMPUTING IN MEDICAL INFORMATICS

Syoji Kobashi[1], Md. Atiqur Rahman Ahad[2], Namkug Kim[3]
Yubing Tong[4] and Naomi Yagi[5]

[1]University of Hyogo, Hyogo, Japan

[2]University of Dhaka, Dhaka, Bangladesh

[3]University of Ulsan, Ulsan, Korea

[4]University of Pennsylvania, Philadelphia, PA, USA

[5]Kyoto University, Kyoto, Japan

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Medical science and engineering have been using various medical systems such as medical imaging devices, medical testing devices, and medical information systems. With those systems, patient information has been collected every day and accumulated in various medical institutions. Also, the medical systems generate high-dimensional, multimodal, and huge data. In order to analyze such big data efficiency, image processing, signal processing and data mining play important roles for computer-aided diagnosis (CAD) and monitoring. Especially, soft computing approaches play a fundamental role in the analysis of such medical data because of the ambiguity of human data. In this special issue, we focus on soft computing approaches for medical informatics. It aims to gather the latest research on state-of-the-arts for medical informatics analysis methods, and recent new findings obtained by utilizing the new computational methodologies. We invited investigators to contribute original research articles as well as review articles dealing with timely issues. Some papers are invited to submit from the 4$^{\text{th}}$ International Conference on Informatics, Electronics and Vision (ICIEV), Japan, 2015.

This special issue attracted authors in various areas, e.g., CAD system, computer-aided detection (CADe) systems, computer-aided surgery (CAS) systems, hospital information system (HIS), image/signal processing theory and algorithms, image reconstruction, knowledge engineering, medical informatics, medical image/signal analysis, medical image/signal acquisition theory/algorithm/systems, multidimensional data visualization, pattern recognition, and soft computing. Based on these topics, we received twelve submissions from various parts of the world. From these submissions, four papers have been accepted finally.

It is known that brain shapes of newborn or low-birth babies deform quickly by natural growth, and the morphological growth rate or changes in human brain vary from person to person. Hence, physiological age estimation based on brain MR image analysis is a very daunting task. S. B. Alam et al. [1] take the challenge to create a smart regression model in order to predict a person's age based on various landmarks extracted from MR images by assessing changes in landmark distances with chronological age. They propose a deformation index to evaluate deformation with age. To estimate brain age, principal component analysis (PCA), manifold learning and multiple regression model are exploited in this paper. The regression model is trained from a diverse set of subjects that has significant variations. It is employed to decipher anatomical structure related to age and deformation, and to fit new subjects to estimate age. To optimize the parameter used in manifold learning, PCA is employed to anatomical landmark distances. The absolute

value drawn from PCA helps to identify the desired parameter. The proposed method is applied on a benchmark dataset called OASIS database for adults and clinically available neonatal dataset. The experimental results are found to be excellent.

Wearable healthcare monitoring systems are getting more familiar day by day. Hence, a variety of wearable systems equipped with sensors are being developed to provide biological information to wearers, to avoid lifestyle-related diseases, and to employ in other applications. S. Toda et al. [2] design and fabricate a flexible as well as stretchable wiring for wearable health care systems, by using magnetic powder as conductor in hollow silicone rubber tube. They employ NdFeB powder, which is coated with Au/Cu metal film. The proposed design can demonstrate high conductivity. The experiments reveal that the wiring has a stable conductivity of 4.92 S/cm with the axial strain up to 60%. Through remagnetization, the performance and stability of the wiring can be improved.

K. Honda et al. [3] propose a fuzzy k-member clustering for crowd movement analysis based on face recognition. Privacy preserving data analysis is a requirement and the demand is higher now. Hence, any kind of visual monitoring and information extraction while retaining privacy gets more importance than without privacy. Crowd-movement monitoring is very important for various applications. Hence, a smarter approach along with privacy-preservation strategy is required. In this method, the movement of an individual is tracked by matching face images taken by cameras in different places, and is summed up to crowd movement. Initially, face image features are k-anonymized by utilizing fuzzy cluster partitions. Then face image matching is done. In this case, Eigen-face approach is used for face recognition. Note that k-anonymization technique can quantitatively guarantee privacy preservation. In this approach, anonymity level k is set so that every sample is indistinguishable from at least $(k-1)$ other samples. This approach is experimented in a limited dataset so far. In future, more realistic and wider datasets should be explored for further furnishing the proposed method. Other face recognition approaches can also be explored if the image resolutions are varied, which is realistic due to the distance or angles of human movements in different scenes.

A new face feature extraction approach under different resolutions is proposed by Y. Wang and Y. Wang [4]. Local binary pattern (LBP) [5] and its variants are very widely-used by research communities for various applications. LBP along with deep belief networks (DBNs) is fused to extract smart features from face. Individually, LBP has some limitations on recognizing face in various illuminations as well as resolutions. The proposed method exploits the extreme learning machine (ELM) algorithm into the network training process. The network after training is used to classify and recognize two benchmark datasets, namely FERET and ORL face databases with different resolutions. The obtained results are fairly satisfactory.

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