GUEST EDITORIAL

Special Section on Biomedical Image Representation

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This special section of the Journal of Electronic Imaging is devoted to the general topic of biomedical image representation. Biomedical image representation covers applications of image acquisition, processing, and analysis techniques specially suited for medical images and includes a wide field of well established as well as emerging techniques in imaging.

The nine papers published in this section represent only a few of the current issues involved with digital medical image acquisition, segmentation/detection of contour, compression, 3D visualization, and interpretation of specific medical data screening. Due to limited time, we could not include many other interesting topics in this area for this special section.

Digital imaging allows a convenient way to enhance/restore images prior to display while also providing efficient archiving and transmission capabilities. In the first paper of this section, Aach, Schiebel, and Spekowius review the current status of digital x-ray imaging in medicine, present the concept of a unified radiography/fluoroscopy solid state detector, and suggest an algorithm for reduction of noise in images acquired with low x-ray dose.

Due to the advantages of a digital image environment in representing, processing, archiving and transmission of medical information, digital medical images are becoming the preferred modality over analog images. However, huge volumes of medical image data necessitate the use of low bit rate data representation without perceived loss of image quality. Despite the legal issues involved in medical image compression, a multi-resolution coding and progressive transmission scheme is likely to be adapted in the future in teleradiology since initial low resolution images can provide useful information by fast transmission while the completely lossless images can be reconstructed in time. Such a progressive transmission model for radiographic images using a high fidelity wavelet based adaptive vector quantization is discussed by Mitra and Yang.

Quantitative analysis of medical images requires the development of optimal segmentation models. The paper by Preteux *et al.* presents a new approach to brochi segmentation in high resolution computerized tomography based on model based morphological filtering. An automated segmentation scheme for lung contour detection in chest radiographs using simplified convolutional neural networks has been discussed by Tsujii, Freedman and Mun. Brejl and Sonka address the general problem of medical image segmentation and suggest an automated design of optimal border detection for the development of general multi-purpose image segmentation systems from optimization criteria based on feature exemplars for training embedded neural networks in the system architecture.

Morphological granulometric features are used for unsupervised segmentation of digital mammograms by Baeg *et al.* for discriminating textural changes while wavelet and statistical features are used by Yu, Guan, and Brown for a supervised neural network classifier for automated detection of microcalcification clusters in digitized mammograms. Due to the large number of patients encountered in mammogram screening programs, an automated detection system is essential: however, effective feature selection is crucial in developing such a system. Dwyer *et al.* review a number of models for mammography screening for evaluating screening and diagnosis protocols to optimize digital image data management systems.

3D visualization of stereo fundus images provides useful diagnostic information in early detection of glaucoma. Ramirez, Mitra, and Morales present a passive stereo vision model for representing the 3D topography of the optic nerve head using a depth-from-stereo algorithm based on disparity detection by a cepstrum matching procedure. The algorithm uses a coarse to fine strategy for refining the disparity map. Finally, a cubic B-spline interpolation scheme is used to obtain a smoother representation of the optic nerve head deformation due to glaucoma.

We would like to thank all the authors for their contributions to this special section. We are very appreciative of the support provided by the editors of the *Journal of Electronic Imaging* in the preparation of the final presentation of the documents in such a short time.

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