Editorial

Application of Image Processing Techniques in Molecular Imaging of Cancer

Bingsheng Huang,1 Guoyan Zheng,2 Ziyue Xu,3 Shengxiang Rao,4 and Silun Wang5

1School of Biomedical Engineering, Health Science Centre, Shenzhen University, Shenzhen, China
2Institute for Surgical Technology and Biomechanics, University of Bern, Bern, Switzerland
3Center for Infectious Disease Imaging (CIDI), Radiology and Imaging Science Department, National Institutes of Health (NIH), Bethesda, MD 20892, USA
4Department of Radiology, Zhongshan Hospital, Fudan University, Shanghai, China
5Department of Radiology and Imaging Sciences, Emory University School of Medicine, Atlanta, GA, USA

Correspondence should be addressed to Bingsheng Huang; huangbs@gmail.com

Received 23 October 2017; Accepted 23 October 2017; Published 13 November 2017

Cancer is one of the leading causes of death all over the world. The research of cancer has always been a major focus in the medical imaging field. Modern imaging technology such as molecular imaging has already been shown to be useful in enhancing cancer management, including early detection, more accurate diagnosis, better treatment planning, and treatment monitoring in an early stage. Molecular imaging enables in vivo visualization and measurement of biological process at the cellular and molecular level. It allows not only localization of tumor lesions but also visualization of the expression and activity of specific molecules, which have great influence on tumor behavior and response to treatment. Many different modalities, such as MRI, SPECT, and PET, have been developed and used for noninvasive molecular imaging and have played a critical role in clinical oncology. However, due to large intersubject variability and various parameters in molecular images, it is generally infeasible to derive a single analytic method or simple equations that can describe the targets such as lesions and anatomies in all the images. Hence, in order to facilitate further the application of molecular imaging in clinical oncology, image processing techniques have become a major focus in molecular imaging research, so that we can make better use of the rich information in the molecular image data.

The aim of this special issue is to provide a platform for high quality works on image processing and molecular imaging of cancer. Original papers and review articles focusing on the latest application of image processing techniques in multimodality cancer molecular imaging were submitted. The topics included pharmacokinetic modeling approaches, computer-aided detection/diagnosis of cancer, treatment evaluation and prognostication of cancer, segmentation/delineation of tumor lesions, correlation between molecular image data and other medical data of cancer from a medical perspective, advantages and limitations of existing and new imaging processing software/techniques, the importance of molecular image processing within the entire cycle of cancer patient management, and some other image processing techniques applied in cancer molecular imaging. We received a total of 16 submissions, and after two rounds of rigorous review, 5 papers were accepted for publications in this special issue.

In the paper “Head and Neck Cancer Tumor Segmentation Using Support Vector Machine in Dynamic Contrast-Enhanced MRI,” W. Deng et al. proposed an automatic method based on Support Vector Machine (SVM) and Dynamic Contrast-Enhanced Magnetic Resonance Imaging (DCE-MRI) to segment the tumor lesions of head and neck cancer (HNC). They calculated five curve features and
In the review article “Application of Deep Learning in Automated Analysis of Molecular Images in Cancer: A Survey,” Y. Xue et al. review the applications of deep learning in molecular imaging in terms of tumor lesion segmentation, tumor classification, and survival prediction. They also outline some future directions in which researchers may develop more powerful deep learning models for better performance in the applications in cancer molecular imaging.

**Acknowledgments**

The guest editorial team would like to thank the authors submitting their works to this special issue. The editors also thank the professional reviewers for their precious help with review assignments. They hope the papers of this special issue contribute to this interesting and fast-moving field of molecular imaging.

Bingsheng Huang
Guoyan Zheng
Ziyue Xu
Shengxiang Rao
Silun Wang