COMMUNICATIONS IN NUMERICAL METHODS IN ENGINEERING
Commun. Numer. Meth. Engng 2009; **25**:581–582
Published online 12 March 2009 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/cnm.1244

Editorial

Special issue on recent advances in computational techniques for biomedical imaging[‡]

GUEST EDITORS: Guo-Wei Wei[1,*,†] and Ge Wang[2]

[1]*Department of Mathematics and Department of Electrical and Computer Engineering, Michigan State University, MI, U.S.A.*
[2]*Biomedical Imaging Division, Virginia Polytechnic Institute and State University, VA, U.S.A.*

SUMMARY

A total of 12 papers in the area of mathematical methods and computational techniques for biomedical imaging and image analysis are presented in this special issue. Copyright © 2009 John Wiley & Sons, Ltd.

KEY WORDS: biomedical imaging; tomography; image analysis; mathematical methods; computational techniques

Recent advances in biomedical/molecular imaging have greatly improved diagnosis, therapy and discovery in both clinical and pre-clinical milieu. While traditional tomographic and image processing methods have become increasingly sophisticated, the emerging new modalities play promising roles in anatomical, functional, cellular and molecular imaging. Image registration, segmentation and characterization are still challenging issues in developing computer-aided expert systems. Mathematical and computational techniques have been instrumental in these developments.

This special issue consists of 12 papers. The paper by Guo *et al.* [1] deals with image registration, a well-known topic in image analysis. Alexander *et al.* [2] present a new texture-based approach for tissue characterization with high-resolution CT scans. Gloger *et al.* [3] propose a level set-based segmentation method for analyzing MR Images. Wang and Han [4] discuss the solution of diffuse optical tomography with a connection to bioluminescence tomography. The paper by Sun *et al.* [5] demonstrates the performance of an adjoint method for diffuse optical tomography. A high-order finite element method is proposed by Hou *et al.* [6] for the forward analysis of

*Correspondence to: Guo-Wei Wei, Department of Mathematics and Department of Electrical and Computer Engineering, Michigan State University, MI, U.S.A.
†E-mail: wei@math.msu.edu
‡This article was published online on 12 March 2009. An error was subsequently identified. This notice is included in the online and print versions to indicate that both have been corrected [4 April 2009].

bioluminescence tomography. Shi *et al.* [7] consider a multi-grid finite element approach for bioluminescence tomography. Yu *et al.* [8] present an exact and stable region of interest (ROI) reconstruction approach for single photon emission computed tomography (SPECT) from uniformly attenuated local projections. Dehghani *et al.* [9] design an algorithm for modeling and reconstruction of near-infrared optical tomography. The paper by Podshivalov *et al.* [10] offers a 2D micro-scale finite element method for computerized bone diagnosis. Lu and Chatziioannou [11] simulate the photon migration with a parallel adaptive finite element method. Finally, Qu and Jiang [12] examine the Landweber scheme for solving compact operator equations and their biomedical applications.

We wish to express our gratitude to the Editor-in-Chief Professor Roland W. Lewis and Editor Professor Perumal Nithiarasu for allowing us to produce this special issue. We also thank all the authors for contributing their original papers and all the reviewers for their dedicated work that has substantially refined the quality of the papers in this special issue.

REFERENCES

[corrections have been made to this section after initial online publication]

1. Guo H, Nam H, Renaut R, Chen K, Farin G. Improved inter-modality image registration using normalized mutual information with coarse-binned histograms. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1176.
2. Alexander S, Papadakis M, Bodmann B, Vela D, Baid S, Gittens A, Kouri DJ, Gertz S, Jain S, Romero J, Li X, Cherukuri P, Cody D, Gladish G, Aboshady I, Conyers J, Casscells S. Texture-based tissue characterization for high-resolution CT scans of coronary arteries. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1189.
3. Gloger O, Ehrhardt M, Dietrich T, Hellwich O, Graf K, Nagel E. A three stepped coordinated level set segmentation method for identifying atherosclerotic plaques on MR-images. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1213.
4. Wang G, Han W. An integrated solution and analysis of bioluminescence tomography and diffuse optical tomography. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1163.
5. Sun LZ, Wang ZG, Fajardo L, Wang G. Modeling and reconstruction of diffuse optical tomography using adjoint method. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1175.
6. Hou YB, Tian J, Wu Y, Liang J, He X. A new numerical method for BLT forward problem based on high-order finite elements. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1202.
7. Shi J, Tian J, Xu M. Reconstruction-oriented multigrid finite element algorithm on bioluminescence tomography incorporating priori information. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1157.
8. Yu HY, Yang JS, Jiang M, Wang G. Interior SPECT—exact and stable ROI reconstruction from uniformly attenuated local projections. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1206.
9. Dehghani H, Eames M, Yalavarthy P, Davis S, Srinivasan S, Carpenter C, Pogue B, Paulsen K. Near infrared optical tomography using NIRFAST: algorithms for numerical model and image reconstruction algorithms. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1162.
10. Podshivalov L, Holdstein Y, Fischer A, Bar-Yoseph P. Towards a multi-scale computerized bone diagnostic system: 2D micro-scale finite element analysis. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1214.
11. Lu YJ, Chatziioannou A. A parallel adaptive finite element method for the simulation of photon migration with the radiative-transfer-based model. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1167.
12. Qu GR, Jiang M. Landweber scheme for compact operator equation in Hilbert space and its applications. *Communications in Numerical Methods in Engineering*. DOI: 10.1002/cnm.1196.

