Design and implementation of automatic 3D multimodal colon segmentation

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ABSTRACT

Unlike traditional colonoscopy, virtual colonoscopy is a safe and fast medical imaging procedure to screen the colon for polyps. And it has become very popular recently. Colon segmentation is a necessary and important step of such an examination procedure. In this thesis, an automatic colon segmentation method is proposed. The fluid is first identified and removed based on its characteristic of horizontal surface. A simple 3D region growing algorithm – connected threshold is applied to obtain initial segmentation of air, which is served as the basis of the ensuing automatic locating object and background seeds. Then the isolated-connected threshold algorithm, together with the above seeds, is applied to obtain the final results. The colon wall is obtained by applying morphological operations to the segmentation results of air. The proposed algorithm can automatically segment different substances based on the isolated-connected threshold. It also allows the user to modify the segmentation results interactively by providing more object or background seeds.

Keywords : virtual colonoscopy、colon segmentation

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REFERENCES

[1]行政院衛生署98年度死因統計, http://www.doh.gov.tw/CHT2006/DM/DM2_2_p02.aspx?class_no=440&now_fod_list_no=11397&level_no=4&doc_no=76512，2010年。

[2]馬任明，了解大腸癌，台北市，浩園文化事業有限公司，2001年。

[3]藤田 伸，認識大腸癌，高雄市，長年出版社，2000年。

[4]馬偕醫院 胃腸肝膽科， http://www.mmh.org.tw/gi/，2010年。

[5]Prosise, J. " Programming Windows with MFC" 2nd ed. Washington, U.S.A., Microsoft Press, 1999.

[6]Frank Bushmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, "Pattern-Oriented Software Architecture – A System of Patterns, " England, John Wiley & Sons, 2001.

[7]NEMA, Digital Imaging and Communications in Medicine, U.S.A., National Electrical Manufacturers Association, 2004.

[8]Ibanez, L., et al. "The ITK Software Guide, " U.S.A., Kitware Inc., 2005.

[9]Nobuyuki Otsu, "A threshold selection method from gray-level histograms". IEEE Trans. Sys., 1979.

[10]Chen, D., Wax, M.R., Li, L., Liang, Z., Li, B., and Kaufman, A.E. "A Novel Approach to Extract Colon Lumen from CT Images for Virtual Colonoscopy," IEEE Transactions on Medical Imaging, Vol.19, No.12, 1220-1226, 2000.

[11]Hong, L., Kaufman, A., Wei, Y.C., Viswambharan, A. Wax, M., and Liang, Z. "3D Virtual Colonoscopy," Proceedings of the 1995

Biomedical Visualization, pp.26-32, 1995.
[12]Sato, M., Lakare, S., Wan, M., Kaufman, A.E., Liang, Z., and Wax, M.R. "An Automatic Colon Segmentation for 3D Virtual Colonoscopy," IEICE Transactions on Information and Systems, E84-D(1), pp.201-208, 2001.
[13]Kitware Inc. "An Object – Oriented Approach To 3D Graphics," United States of America, Kitware Inc., 2003.
[14]林上智，“以框架為基礎之虛擬大腸鏡系統”，大葉大學資工所碩士論文，民國96年。