A Framework-Based Virtual Colonoscopy System

Ku-Yaw Chang,Shang-Chih Lin,Shao-Jer Chen

E-mail: canseco@ mail.dyu.edu.tw

ABSTRACT

Virtual colonoscopy is a computer-based alternative to traditional optical colonoscopy for examining the interior structures of human colon. This technique is often used to examine colonic polyps for early colon cancer detection. What physicians see could be remains inside the colon, not the colon itself. Even seeing the colon surface is not enough. In clinical examinations, physicians are forced to go back and forth between 2D and 3D images, which become a very time-consuming procedure. Since virtual colonoscopy integrates medical imaging and computer graphics technolo-gies, it requires much effort to develop such a system. It, therefore, becomes quite an important issue of how to easily build a virtual colonoscopy system as a platform for further research. In this paper, we describe a practical approach of building a virtual colonoscopy based on the framework composition technology, including using MFC (Microsoft Foundation Class) for graphical user interface, ITK (Insight Toolkit) for image segmentation and VTK (Visualization Toolkit) for scientific visualization. Building applications based on frameworks allows developers to reuse common functionality and then focus on solving domain-specific problems.

Keywords: Virtual Colonoscopy   Surface Rendering.   Application Framework   Image Segmentation

REFERENCES

[1] 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.

[2]   , "   " ,   ,   ,   193-196,   94

[3] Ko, C.C., and Jang, J.W. " Interactive Polyp Biopsy based on Automatic Segmentation of Virtual Colonoscopy, " Proceedings of the Fourth IEEE Symposium on Bioinformatics and Bioengineering, pp.159-166, 2004.

[4] 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.

[5] 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.

[6] Lorensen, W.E., and Cline, H.E. " Marching cubes: A High Resolution 3D Surface Construction Algorithm," Computer Graphics, Vol.21, No.4, 163-169, 1987.

[7] Kitware Inc. " An Object – Oriented Approach To 3D Graphics, " United States of America, Kitware Inc., 2003.

[8] Lee, T.Y., Lin, P.H., Lin, C.H., Sunm Y.N., and Lin, X.Z. " Interactive 3-D Virtual Colonoscopy System, " IEEE Trans on Information Technology in Biomedicine, Vol.3, No.2 , pp.139-150, 1999.

[9] Fayad, M.E., Schmidt, D.C., and Johnson, R.E. " Building Application Frameworks: Object-Oriented Foundations of Framework Design," New York: John Wiley and Sons, 1999.

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

[11] Ibanez, L., et al. " The ITK Software Guide, " U.S.A., Kitware Inc., 2005. [12] Kitware Inc. " The VTK User's Guide, " United States of America, Kitware Inc., 2003. [13] Sun, X., Qian, T., Li, M., and Gu, L. " Interactive Virtual Colonoscopy System based on CT Volume Images," IEEE International Conference on Communications, Circuits and Systems, Vol.2, pp.912-915, 2005.

[14]