數位資訊強化及邊界檢測--以心臟核磁共振影像為案例

劉邦彥、傅家啟

E-mail: 8809533@mail.dyu.edu.tw

摘 要

在工業化國家由於人民生活壓力增加，許多疾病都逐漸威脅人民健康，尤其在心血管疾病方面。而國內外各種影像技術在心血管診治工作中均佔有舉足輕重的地位，而核磁共振（Magnetic Resonance Image）是其中一個重要組成部分。但由於靜態血流信號可使心肌與血液的界線模糊不清，所以醫師在心室內外膜之邊緣檢測程序上，依然以手動方式來圈選其邊界，不僅非常耗時且無法持續其準確性及醫療品質。本研究以心臟核磁共振影像為案例，強化左心室之資訊，進而自動圈選內外膜之邊界，提供醫師一有效之診斷工具。 本研究分為兩階段，第一階段為應用小波變換法來強化左心室之影像資訊。小波變換法發展歷史雖不久，但在強化影像技術上卻有不錯之功效。第二階段為結合 Fleagle et. al. [7] 之心室邊界檢測法，進而評估本研究與其演算法在內外心膜邊界檢測上之績效。 本研究可達成下列具體成果：(一) 提供醫師一自動檢測內外心膜之演算法，以減輕醫師之負擔，進而維持醫療品質。(二) 提供有關影像強化技術於心臟核磁共振影像上，以供後續研究之參考。

關鍵詞 : 影像強化 ; 階梯平滑化法 ; 小波變換法 ; 邊界檢測 ; 動態規劃

目錄

參考文獻

1. Atkins, M. S., Mackiewich, B.T., Fully Automatic Segmentation of the Brain in MRI,IEEE Transactions on Medical Imaging, Vol. 17,No. 1, 1998 , pp. 98-107. 2. Chan, H. P., et. al., Improvement in Radiologists'' Detection of Clustered Microcalcifications on Mammograms — The Potential of Computer-Aided Diagnosis. Invest. Radiology, No. 10, Oct., 1990, pp. 1102 — 1110. 3. Fleagle, S.R., Thedens, D.R., Stanford, W., Pettigrew, R.L., Reichek, N.,Skorton, D. J, Multicenter Trial of Automated Border Detection in Cardiac MR Imaging, JMRI , Vol. 3, No2.March / April 1993. 4. Giger, M. L, et. al., An Intelligent Workstation for Computer-AidedDiagnosis, Radio. Graphics, Vol. 13. 1993, pp. 647 - 656. 5. Gordon, R., Rangayyan, R. M., Feature enhancement of film mammograms using fixed and adaptive neighborhoods, Applied Optics, Vol. 23, No. 4, 1984, pp. 560 - 564. 6. Gramatikov, B. and Georgiev, I. Wavelets and Alternative to Short-Time Fourier Transform in Signal-Averaged Electrocardiography, Med. & Bio. Engr. & Computig, Vol. 33, No. 3, 1995, pp. 482 — 487. 7. Laine, A. F. et. al., Mammographic Feature Enhancement by Multiscale Analysis, IEEE Transactions on Medical Imaging, Vol. 13, No. 4, December 1994, pp. 725 — 740 8. Laine Andrew F., Sergio Schuler, Jian Fan, and Walter Huda Mammographic Feature Enhancement by Multiscale Analysis, IEEE Transactions on Medical Imaging, Vol. 13, No. 4, 1994, pp. 725-740. 9. Lin, Zhiyue and Chen, J. Z. Chen, Comparison of Three Running Spectral Analysis Methods, Electrogastrography Principles and Applications, 1994, pp. 75-99. 10. Mallat, S.,A wavelet tour of signal processing, Academic Press,1998. 11. Nishikawa, R. M., et. al., Computer-Aided Detection of Clustered Microcalcifications - An Improved Method for Grouping Detected Signals, Med. Physics, 20 (6), 1993, pp. 1661 - 1666. 12. Nishikawa, R. M., et. al., Computer-Aided Detection of Clustered Microcalicifications on Digital Mammograms, Med. & Bio. Engr. & Computig, March, 1995, pp. 174 - 178. 13. Qian Wei, Maria Kallergi, Laurence P. Clarke, Huai-Dong Li, Priya Venugopal, Dnsheng Song, and Robert A. Clark, Tree structured wavelet transform segmentation of microcalcifications in digital

mammography, Medical Physics, Vol. 22, No. 8, 1995, pp. 1247-1254 14. Vikram Chalana and Yongmin Kim, A Methodology for Evaluation of Boundary Detection Algorithms on Medical Images, IEEE Transaction on Medical