

【文献調査】

Texture and color based image segmentation and pathology detection in capsule endoscopy videos

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2015年04月27日

1 タイトル

カプセル内視鏡動画におけるテクスチャ及びカラーベースの画像領域分割と病態検出

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Computer Methods and Programs in Biomedicine, Vol. 113, No. 1, pp.396–411, 2014

4 アブストラクト

本論文ではワイヤレスカプセル内視鏡 (WCE) 画像の探究的解析を行うために、いくつかの手法について綿密な研究について示す。胃腸の様々な異常に対応する画像領域の可変的なテクスチャとカラーベースの記述子が WCE フレーム内にある病変を正確に検出することを検証する。さらに、近傍のテクスチャ特徴で記述された単一ピクセルを分類することにより、画像は画像の内容と整合性の取れた領域に分割される。検出と領域分割のいずれの手法も特徴量算出や特徴量のサブセットの選択、分類の段階で構成される同じ手順が適用される。この一般的な3段階フレームワークは様々な認識の戦略を用いて実現される。具体的には、開発されたベクターサポート凸包分類アルゴリズムの性能が2つの異なる特徴量選択手法で構成されるサポートベクターマシンと比較される。

5 キーワード

Capsule endoscopy, Feature selection, Texture analysis, Medical image analysis

6 参考文献

6.1 WCE の立ち位置に関する文献

[1] E. Scapa, H. Jacob, S. Lewkowicz, M. Migdal, D. Gat, A. Gluckhovski, N. Gutmann and Z. Fireman, "Initial experience of wireless-capsule endoscopy for evaluating occult gastrointestinal bleeding and suspected small bowel pathology: clinical use of wireless-capsule video endoscopy" *The American Journal of Gastroenterology*, Vol. 97, No. 11, pp.2776–2779 2002

[2] B. Lewis and P. Swain, "Capsule endoscopy in the evaluation of patients with suspected small intestinal bleeding: results of a pilot study," *Gastrointestinal Endoscopy*, Vol. 56, No.3, pp.349–353 2002

[3] D. Adler and C. Goustout, "Wireless capsule endoscopy," *Hosp Physician*, Vol. 39, No. 5, pp.14–22 2003

6.2 WCE の有用性に関する文献

[4] P. Swain, "Wireless capsule endoscopy and Crohn's disease," *GUT*, Vol. 54, No. 3, pp.323–326 2005

[5] F. Wartel, V. Maunoury, P. Bulois, S. Papadopoulos, B. Filoche and J.F. Colombel, "Smallbowel ulcerations at wireless capsule endoscopy: go the whole way," *GUT*, Vol. 56, No. 8, pp.1132 2007

[6] M.M. Chait, "Gastroesophageal reflux disease: important considerations for the older patients," *World Journal of Gastrointestinal Endoscopy*, Vol. 2, No. 12, pp.388–396 2010

[7] H.P. Lukashok, Carlos Robles-Jara, Carlos Robles-Medrand, "Multiple Intestinal Erosions as a Result of Hemorrhage due to Parasites: Case Reports and Review of the Literature," *Diagnostic and Therapeutic*

Endoscopy, Vol. 2011, pp.1–3 2011

[8] M.K. Goenka, S. Majumder, S. Kumar, P.K. Sethy and U. Goenka, "Single center experience of capsule endoscopy in patients with obscure gastrointestinal bleeding," *World Journal of Gastrointestinal Endoscopy*, Vol. 17, No. 6, pp.774–778 2011

6.3 WCE 画像の領域分割に関する文献

[9] J. Berens, M.W. Mackiewicz and G.D. Bell, "Stomach, intestine, and colon tissue discriminators for wireless capsule endoscopy images," in *Medical Imaging 2005: Image Processing*, pp.774–778 2005

[10] M. Coimbra, P. Campos and J. Cunha, "Topographic Segmentation and Transit Time Estimation for Endoscopic Capsule Exams," in *2006 IEEE International Conference on Acoustics, Speech and Signal Processing, 2006. ICASSP 2006*, Vol. 2, pp.1164–1167 2006

[12] M. Mackiewicz, J. Berens and M. Fisher, "Wireless capsule endoscopy color video segmentation," *IEEE Transactions on Medical Imaging*, Vol. 27, No. 12, pp.1769–1781 2008

6.4 WCE の移動速度の問題に関する文献

[13] F. Vilarino, L.I. Kuncheva and P. Radeva, "Roc curves and video analysis optimization in intestinal capsule endoscopy," *Pattern Recognition Letters*, Vol. 27, No. 8, pp.875–881 2006

6.5 WCE の移動速度の推定に関する文献

[14] P.M. Szczypiński, R.D. Sriram, P.V. Sriram and D.N. Reddy, "A model of deformable rings for interpretation of wireless capsule endoscopic videos," *Medical Image Analysis*, Vol. 13, No. 2, pp.312–324 2009

6.6 WCE 画像の解析手法に関する文献

[15] N. Bourbakis, "Detecting abnormal patterns in wce images," in *Fifth IEEE Symposium on Bioinformatics and Bioengineering, 2005. BIBE 2005*, pp.232–238 2005

[16] V. Kodogiannis, M. Boulougoura, J. Lygouras and I. Petrounias, "A neuro-fuzzy-based system for detecting abnormal patterns in wireless-capsule endoscopic images," *Neurocomputing*, Vol. 70, No. 4–6, pp.704–717 2007

[17] D.J.C. Barbosa, J. Ramos and C.S. Lima, "Detection of small bowel tumors in capsule endoscopy frames using texture analysis based on the discrete wavelet transform," in *30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 2008. EMBS 2008*, pp.3012–3015 2008

[18] B. Li and M.-H. Meng, "Ulcer recognition in capsule endoscopy images by texture features," in *7th World Congress on Intelligent Control and Automation, 2008. WCICA 2008.*, pp.234–239 2008

[19] M.W. Mackiewicz, M. Fisher and C. Jamieson, "Bleeding detection in wireless capsule endoscopy using adaptive colour histogram model and support vector classification," in *Medical Imaging 2008: Image Processing*, pp.1–12 2008

[20] B. Li and M.-H. Meng, "Computer-based detection of bleeding and ulcer in wireless capsule endoscopy images by chromaticity moments," *Computers in Biology and Medicine.*, Vol. 39, No. 2, pp.141–147 2009

[21] P. Szczypiński and A. Klepaczko, "Convex hull-based feature selection in application to classification of wireless capsule endoscopic images," *Advanced Concepts for Intelligent Vision Systems Lecture Notes in Computer Science*, Vol. 5807, pp.664–675 2009

[22] S. Hwang and M. Celebi, "Polyp detection in wireless capsule endoscopy videos based on image segmentation and geometric feature," in *2010 IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP)*, pp.678–681 2010

[23] V. Charisis, L. Hadjileontiadis, C. Liastos, C. Mavrogiannis and G. Sergiadis, "Capsule endoscopy image analysis using texture information from various colour models," *Computers in Biology and Medicine.*, Vol. 107, No. 1, pp.61–74 2012

[24] D. Barbosa, D. Roupar, J. Ramos, A. Tavares, C. Lima, "Automatic small bowel tumor diagnosis by using multi-scale wavelet-based analysis in wireless capsule endoscopy images," *Biomedical engineering online*, Vol. 11, No. 3 2012

6.7 特徴量選択に関する文献

- [25] W. Siedlecki and J. Sklansky, "On automatic feature selection," *Handbook of pattern recognition & computer vision*, pp.63–87 1993
- [26] P. Pudil, J. Novovicova and J. Kittler, "Floating search methods in feature selection," *Pattern Recognition Letters*, Vol. 15, No. 11, pp.1119–1125 1994
- [27] R. Kohavi and G. John, "Wrappers for feature subset selection," *Wrappers for feature subset selection*, Vol. 97, No. 1–2, pp.273–324 1997
- [28] I. Oh, J. Lee and B. Moon, "Hybrid genetic algorithms for feature selection," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Vol. 26, No. 11, pp.1424–1437 2004
- [29] J. Dy and C. Brodley, "Feature selection for unsupervised learning," *Journal of Machine Learning Research*, Vol. 5, pp.845–889 2004
- [28] A. Klepaczko and A. Materka, "Clustering-stability based feature selection for unsupervised texture classification," *Clustering-stability based feature selection for unsupervised texture classification*, Vol. 18, No. 2, pp.125–141 2009