

Applications

Novel Aspects of Digital Imaging

© 2011 by IJCA Journal

ISBN:

978-93-80865-47-9

Year of Publication: 2011

Authors:

Donia Ben Hassen

Hassen Taleb

Ismahen Ben Yaakoub

Najla Mnif

10.5120/4156-320

{bibtex}spe320t.bib{/bibtex}

## Abstract

In this paper, we present an approach where we integrate spatial relations in the process of segmentation of chest radiography. In the proposed approach, spatial relations are represented as fuzzy subsets of the image space. Using this strategy, we imitate the reasoning of a physician when interpreting a medical image. The results demonstrate that the introduction of spatial relations can improve the recognition and segmentation of structures with low contrast and ill-defined boundaries.

## Reference

- Ginneken, B. v., Hogeweg, L., & Prokop, M. (2009). Computer-aided diagnosis in chest radiography: Beyond nodules. *European Journal of Radiology* , 72, 226–230.
- Rühl, R., Wozniak, M. M., Werk, M., Laurent, F., Mager, G., Montaudon, M., et al. (2008). Csl-detector-based dual-exposure dual energy in chest radiography for lung nodule

detection:results of an international multicenter trial. European Society of Radiology , 18,1831-1839.

- Pietka, E. (1994). Lung Segmentation in Digital Radiographs. Journal of Digital Imaging , 7 (2), 79-84
- Ginneken, B. v., Romeny, B. M., & Viergever, M. A. (2001). Computer-Aided Diagnosis in Chest Radiography:A Survey. IEEE TRANSACTIONS ON MEDICAL IMAGING , 20 (12),1228-1241.
- Li, L., Zheng, Y., Kallergi, M., & Clark, R. A. (2001). Improved Method for Automatic Identification of Lung Regions on Chest Radiographs. Acad Radiol ,8, 629–638.
- Iakovidis, D. K., & Papamichalis, G. ( 2008, September 10–12). Automatic Segmentation of the Lung Fields in Portable Chest Radiographs based on Bézier Interpolation of Salient Control Points. IEEE International Workshop on Imaging Systems and Techniques – IST 2008 .
- Armato, S. G., Maryellen, L. G., & MacMahon, H. (1998). Automated Lung Segmentation in Digitized Posteroanterior Chest Radiographs. Acad Radiol , 5 (4), 245-255.
- Brown, M. S., Wilson, L. S., Doust, B. D., Gill, R. W., & Sun, C. (1998). Knowledge-based method for segmentation and analysis of lung boundaries in chest X-ray images. Computerized Medical Imaging and Graphics , 22 , 463–477.
- Park, W., Hoffman, E. A., & Sonka, M. (1998). Segmentation of Intrathoracic Airway Trees:A Fuzzy Logic Approach. IEEE TRANSACTIONS ON MEDICAL IMAGING , 25(1).
- Zhang, L., Hoffman, E. A., & Reinhardt, J. M.(2006).Atlas Driven Lung Lobe Segmentation in Volumetric X-Ray CT Images. IEEE TRANSACTIONS ON MEDICAL IMAGING , 25 (1), 1-16.
- Bezdek, J., Hall, L., & Clarke, L. (1993). Review of MR Image Segmentation Techniques using Pattern Recognition. Medical Physics , 20, 1033-1048.
- McNitt-Gray, M. F., Huang, H. K., & Sayre, J. W. (1995). Feature selection in the pattern classification problem of digital chest radiograph segmentation. IEEE Transactions on Medical Imaging , 14 (3), 537-547.
- Tsujii, O., Freedman, M. T., & Mun, S. K. (1998). Automated segmentation of anatomic regions in chest radiographs using an adaptive-sized hybrid neural network. Medical physics , 25 (6), 998–1007.
- Ginneken, B. v., Stegmann, M. B., & Loog, M. (2006). Segmentation of anatomical structures in chest radiographs using supervised methods: a comparative study on a public database. Medical Image Analysis , 10, 19–40.
- Shi, Y., Qi, F., Xue, Z., Chen, L., Ito, K., Matsuo, H., et al. (2008). Segmenting Lung Fields in Serial Chest Radiographs Using Both Population-Based and Patient-Specific Shape Statistics. IEEE TRANSACTIONS ON MEDICAL IMAGING , 27 (4),481-493.
- Vittitoe, N. F., Vargas-Voracek, R., & Floyd Jr, C. E. (1998). Identification of lung regions in chest radiographs using Markov Random Field modeling . Medical Physics , 25 (6), 976–985.
- Loog, M., & Ginneken, v. B. (2002). Supervised segmentation by iterated contextual pixel classification. Proceedings of 16th International Conference on Pattern Recognition, 925–928.
- Dunn, J. C. (1973). A Fuzzy Relative of the ISODATA Process and Its Use in Detecting Compact Well-Separated Clusters" , . Journal of Cybernetics , 3, 32-57.
- Bezdek, J. C. (1981, New York). Pattern Recognition with Fuzzy Objective Function Algorithms. Plenum Press .

- Gomathi, M., & Thangaraj, P. (2010). A New Approach to Lung Image Segmentation using Fuzzy Possibilistic C-Means Algorithm. *International Journal of Computer Science and Information Security* , 7 (3), 222-228.
- Shi, Z., Zhou, P., He, L., Nakamura, T., Yao, Q., & Itoh, H. (2009). Lung Segmentation in Chest Radiographs by Means of Gaussian Kernel-Based FCM with Spatial Constraints. *Sixth International Conference on Fuzzy Systems and Knowledge Discovery*.
- Ginneken, B. v., & ter Haar Romeny, B. M. (2000). Automatic segmentation of lung fields in chest radiographs. *Medical Physics* , 27 (10), 2445–2455.
- Colliot, O., Camara, O., & Bloch, I. (2006). Integration of fuzzy spatial relations in deformable models—Application to brain MRI segmentation. 39, 1401-1414.
- Colliot, O. (2003). Représentation, évaluation et utilisation de relations spatiales pour l'interprétation des images Application à la reconnaissance des structures anatomiques en imagerie médicales. Thesis, ENST-Département TSI.
- L.A.Zadeh. (1988, April). Fuzzy logic. *IEEE Comput.Mag.* , 83-93.
- Bloch, I. (1996). Information combination operators for data fusion: A comparative review with classification. *IEEE Transactions On Systems, Man, And Cybernetics Part A: Systems and Humans* , 26 (1), 52-67.
- Bloch, I. (2005). Fuzzy spatial relationships for image processing and interpretation: a review. *Image and Vision Computing* , 23, 89-110.
- Colliot, O., Tuzikovb, A. V., Cesar, R. M., & Bloch, I. (2004). Approximate reflectional symmetries of fuzzy objects with an application in model-based object recognition. *Fuzzy Sets and Systems* , 147, 141–163.
- Keller, J. M., & Wang, X. (2000). A Fuzzy Rule-Based Approach to Scene Description Involving Spatial Relationships. *Computer Vision and Image Understanding* , 80, 21–41.
- Delaye, A., & Anquetil, E. (2010). Modélisation du positionnement relatif de tracés manuscrits par morphologie mathématique floue. 17ème congrès francophone Reconnaissance des Formes et Intelligence Artificielle.
- Hudelot, C., Atif, J., & Bloch, I. (2008). Fuzzy spatial relation ontology for image interpretation. *Fuzzy Sets and Systems* , 159, 1929– 1951.
- Bloch, I. (1999). Fuzzy relative position between objects in image processing: a morphological approach. *IEEE Transactions on Pattern Analysis and Machine Intelligence* , 21 (7), 657-664.
- Chin-Teng, L., & C.S, G. L. (1991). Neural-Network-Based fuzzy logic control and decision system. *IEEE transactions on computers* , 40 (12).
- A.M.Awal, AM., Mouchère.H, Viard-Gaudin, C., Colloque International Francophone sur l'Ecrit et le Document (CIFED2010), France (2010).

### Index Terms

Computer Science

Image Processing

**Key words**

Chest radiography

Segmentation  
recognition

Spatial relations

Fuzzy sets