A Colored CAD System for Breast Mammography

Maha A.Elhady Almona Ali, BME PhD, SUST, Sudan.
Magdi B. M. Amien, EE Associate Prof, UOG, Sudan

Abstract

Breast Cancer is the most common and life threatening cancer among women. Mammography is the process of using low-energy X-rays to examine the human breast. It is one of the best examination procedures for early detection of breast cancer. Mammograms are the most difficult of radiological images to interpret since they are of low contrast. Radiologists typically diagnose breast abnormalities and indicate their regions from mammograms. Sometimes due to small masses or breast density radiologists may miss the suspicious regions, so the diagnosis can fail. Therefore, efforts in developing Computer Aided Detection/Diagnosis (CAD) algorithms for mammogram analysis will assist radiologist in images interpretation for accurate diagnosis and efficient detection of cancer cells in the earlier stages. This study developed an algorithm to analyze mammograms automatically with colors, in order to detect the abnormal breast tissue. It proposed the use of the Discrete Wavelet Decomposition (DWD) technique using symlet wavelet to find out this detection. Different sets of proposed combination techniques based on the DWD technique were used in order to obtain the best accuracy in breast tissues classification. The study showed that the combination between the un-decimated DWD technique and the Spatial Gray Level Dependency Matrix (SGLDM) achieved the best result. It achieved 98.8% accuracy, 95.0% sensitivity. This accuracy has been verified with the ground truth given in the mini-MIAS database.

This algorithm will help to spare women unnecessary and stressful biopsies.

Figure 1 shows an illustrative image for the program implementation on a mammogram.

Colors: Yellow for Fat tissue, Green for Glandular and connective, Blue for Dense and Red for the abnormal one.

Image

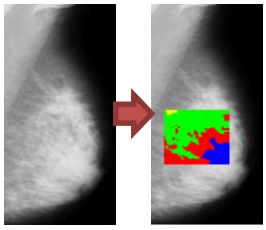


Figure 1: (a) The original mammogram which it had been diagnosed as Fatty-glandular, Asymmetry, Malignant. (b) The mammogram after the implementation of the colored CAD system in sub-image (250 × 250 pixels). The CAD system has been detected the abnormality (colored with red).

Legend:

- **Fat tissue**
- **Glandular and connective tissue**
- **Dense tissue**
- **Abnormal tissue**

Recent Publications

[1] Pelin Gorgel, Ahmet Sertbas, and Osman N. Ucan, '' Feature Extraction Based Wavelet Transform in Breast Cancer Diagnosis Using Fuzzy and Non Fuzzy Classification'', Department of Computer Engineering, Istanbul, Turkey, 2013.

[2] Rajashekar K.R, ''Detection and Classification of Tumors in a Digital Mammogram'', Special Issue of International Journal of Computer Applications (0975 – 8887), International Conference on Electronic Design and Signal Processing (ICEDSP) 2012.

[3] Shengzhou Xu, Hong Liu, Xiangyang Xu, Enmin Song, and Jianye Zeng, ''Bilateral Asymmetry Detection in Mammograms Using Non-rigid Registraion and Pseudo-color Coding'', International Conference on Electrical and Control Engineering (ICECE), IEEE, Electronic ISBN: 978-1-4244-6881-2, 2010

[4] Nizar Ben Hamad, Khaled Taouil, and Med Salim Bouhlel, ''Mammographic Microcalcifications Detection using Discrete Wavelet Transform'', International Journal of Computer Applications (0975 – 8887), Volume 64– No.21, February 2013.

[5] Somchanok Tivatansakul and Keiichi Uchimura, ''Breast mass detection from mammography using iteration of gray-level co-occurrence matrix'', IEEE 18th International Conference on e-Health Networking, Applications and Services (Healthcom), IEEE, INSPEC Accession Number: 16484464, Electronic ISBN: 978-1-5090-3370-6, 2016.

[6] Nalini Singh, Ambarish G Mohapatra, and Gurukalyan Kanungo, ''Breast Cancer Mass Detection in Mammograms using K-means and Fuzzy C-means Clustering'', International Journal of Computer Applications (0975 – 8887), Volume 22– No.2, May 2011.

[7] Maha A.Elhady Almona Ali, and Magdi B. M. Amien, Development of Breast Abnormality Detection System with Colors Based on the Wavelet Decomposition Technique, Proceedings of the 29th International Conference on Computer Applications in Industry and Engineering (CAINE 2016), ISBN: 978–1–943436–04–0, Denver, USA, September, 2016.



Biography

Maha has her expertise and passion in improving the mammograms reading. Her algorithm creates new pathways for improving women healthcare and save their lives. She has developed this algorithm after years of experience in research, applied her algorithms on mammograms from sites for scientific researches and mammograms from hospitals. The algorithm is based on wavelet decomposition technique which is a powerful tool for image analysis.

Email: mahaalmona@yahoo.com

Notes/Comments: