15th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering
and
3rd Conference on Imaging and Visualization
CMBBE 2018
P. R. Fernandes and J. M. Tavares (Editors)

Abstract ID-8

EXTRACTING AND EVALUATING TEXTURE FEATURES FROM BINARY GRADIENT CONTOURS OF MICROCALCIFICATIONS CLUSTERS IN BREAST MAMMOGRAMS

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Keywords: CAD systems, Microcalcifications, Breast cancer, Mammograms, Texture features

Summary: Death women rates related to breast cancer are high worldwide, mainly because of late diagnosis. The best methods for detecting the early signs of breast cancer are clinical and mammographic examinations.
Microcalcifications (MCs) are small granular deposits of calcium that can be found in mammographic routine exams in most breast cancer cases. Despite their frequent occurrence, although 60%–80% are detected via histological examination, only 30%–50% of MCs in breast carcinoma are detected via mammographic examination.
Computer-aided diagnosis (CADx) systems have been developed in an effort to assist MC diagnosis. CADx can be used to provide a second opinion, thereby increasing the accuracy of a radiologist's final diagnosis, and basically involve three steps: (i) segmentation, (ii) features extraction and selection from the segmented MCs and their clusters, and (iii) classification. Such systems are usually based on features extracted from MCs, as compactness, roughness, orientation, and they can help minimizing false-positive and false-negative rates in breast cancer diagnosis.
Texture features combined to morphological features have been studied worldwide to characterize MCs clusters, as well as texture features alone.
In this work, the binary gradient contours (BGC) and local binary pattern (LBP) techniques were applied to calculate 991 texture features from MCs clusters presented on 190 images from Digital Database for Screening Mammography (DDSM). Hence, texture features were ranked, based on mutual information technique. Finally, an incremental procedure sequentially adds the top m-ranked features to the Fisher discriminant analysis to identify the best set of texture features in classifying benign or malignant clusters.
For the 190 images, the procedure determined that 21 texture features are capable of attaining the best classification performance with Area under ROC curve (AUC) =0.928±0.022. It was also found that five texture features are enough to reach AUC =0.891±0.021, which represents the best classification performance considering a minimum of 30 sample images for each texture feature studied. The results achieved using just texture features are encouraging and in accordance with literature. In future, other texture features will be studied in order to improve classification performance.