

Design and implementation of filter bank and Feature matrix of mammography images in order to integrate wavelet transform with artificial neural network in breast cancer diagnosis

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Abstract

Due to the complexity of cancer diagnosis issues, we must be able to combine effective methods based on experience with artificial intelligence techniques and advanced engineering mathematics. The goal is design and implement the filter bank and feature matrix of mammography images in order to integrate wavelet transform with neural network in breast cancer diagnosis. First, by introducing the MIAS database, 200 mammography images related to breast cancer were selected, of which 120 people had benign masses and 80 people had malignant masses. In the first step, isolation of the suspicious area of the mammography image, filtering to improve image visibility and noise reduction, improvement of image contrast using histogram, edge detection in mammography image have been done. In the second step, four types of different families of discrete wavelet db-Sym-Coif Haar- were applied on mammography images. For different types of wavelet transforms, the trade-offs between compression and smoothness are different. This feature means that we can choose a specific type of wavelet transform that is more suitable for the feature we want to extract from the signal. In the third step, we designed and implemented the discrete wavelet transform in the form of a filter bank to act as a sequence of low-pass and high-pass filters and by using a filter bank, we sought to access a very effective way to decompose a signal and mammography images into sub-frequency bands in order to extract and determine the feature matrix as input to the artificial neural network. In the fourth step, for examples of mammography images by applying Sym-II discrete wavelet transform and from each sub-band statistical features such as mean, standard deviation, median as feature matrix and as input, in the design of integrated neural network with wavelet transform, We set the criteria for action. The mentioned process is implemented in the MATLAB R-2016b environment.

Key words

Wavelet transform, neural network, filter bank, feature matrix, mammography images, breast cancer, integrated model.

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