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Breast Cancer Detection Based on Asymmetry Analysis Using Spectral Probable Feature on Thermography Images

Rozita Rastghalam: MS student, Department of Electrical Engineering, Najafabad Branch, Islamic Azad University, Isfahan, Iran

Hossein Pourghassem: Assistant Professor, Department of Electrical Engineering, Najafabad Branch, Islamic Azad University, Isfahan, Iran

Corresponding Author: Hossein Pourghassem, h_pourghasem@iaun.ac.ir

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Abstract

Background: Thermography is a noninvasive, non-contact, fast, and painless imaging technique that is able to detect breast tumors much earlier than the traditional mammography and our aim is automatic classification of normal from abnormal breast thermography based on asymmetric analysis and use of their spectral features.

Methods: In this paper, a novel breast cancer detection algorithm based on spectral probable features is proposed to separate healthy and pathological cases during breast cancer screening. Gray level co-occurrence matrix is made from image spectrum to obtain spectral co-occurrence feature. However, this feature is not sufficient separately. To extract directional and probable features from image spectrum, this matrix is optimized and defined as a feature vector. By asymmetry analysis, left and right breast feature vectors are compared in which certainly, more similarity in these two vectors implies healthy breasts. Our method is implemented on various breast thermograms that are generated by different thermography centers. Our algorithm is evaluated on different similarity measures such as Euclidean distance, correlation and chi-square. The obtained results show effectiveness of our proposed algorithm.

Results: The results showed that Euclidean distance and Correlation had the highest and lowest number of errors respectively. With use gray level co occurrence and two similarity measures mentioned the number of errors was 4 and 11, while these numbers of errors are reduced to 2 and 8 in our proposed method.

Conclusion: The use of co-occurrence vector instead of co-occurrence matrix that is introduced in this paper is a suitable tool for probable feature extraction from spectrum of the thermography image.

Keywords: Breast thermogram, Breast cancer detection, Asymmetric analysis, Image spectrum, Spectral probable feacture.