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An Integrated Index for Breast Cancer Identification using Histogram of Oriented Gradient and Kernel Locality Preserving Projection Features Extracted from Thermograms

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Breast cancer is one of the prime causes of death in women worldwide. Thermography has shown a great potential in screening the breast cancer and overcomes the limitations of mammography. Moreover, interpretations of thermogram images are dependent on the specialists, which may lead to errors and uneven results. Preliminary screening method should detect the hazardous, destructive tumors effectively to improve the accuracy. The growth of malignant tumor can increase the internal temperature which can be captured by thermograms. Thus in this work, locally normalized Histogram of Oriented Gradients (HOG) based preliminary screening Computer Aided Diagnosis (CAD) tool is proposed. HOG is able to record the minute internal variations in thermograms. In order to reduce the dimensions of extracted HOG descriptors Kernel Locality Preserving Projection (KLPP) is used. The resulting KLPP features are then ranked to form an efficient classification model. Various machine learning algorithms are used to validate the proposed method. Our method shows a promising performance with an average accuracy, sensitivity, and specificity of 98 %, 96.66 % and 100 % respectively. We have also developed a Breast Cancer Risk Index (BCRI) using significant KLPP features which can discriminate the two classes using a single integrated index. This can help the radiologists to discriminate the normal and malignant classes during screening to validate their findings.

Keywords: breast cancer; CAD; classification; features; HOG; thermography

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