Chapter 4

Early Detection of Breast Cancer Using Image Processing Techniques

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ABSTRACT

Breast cancer is the second leading cause of death among women according to Cancer Facts and Figures. In order to increase the survival rate of women due to breast cancer, early and accurate detection of breast cancer is very essential. The quality of the image acquired through different breast imaging modalities: mammography, ultrasonography, and magnetic resonance imaging (MRI) have drawbacks which reduces the efficiency of accurate detection. As per the literature survey, the quality of the image acquired through the breast imaging modalities is not optimal for the accurate detection of cancer at the early stage. Digital image enhancement methods have been widely used in radiology in order to enhance the image quality. Considerable research has been undertaken in the development of enhancement of the image to assist radiologists in the identification of breast abnormalities. In order to further improve the efficiency of detection, diagnosis, and treatment of cancer, the quality of the image has to be improved.

1. INTRODUCTION

Primary modality Screening mammography is considered for the diagnosis and screening of breast cancer because Screening Mammography is the easiest and affordable way to diagnose breast cancer (American Cancer Society, 2014; Prannoy Giri, Sara, & Ana Kumar, 2017). For dense tissues the mammogram images are low in contrast and noisy nature. Because of this, difficulties are being faced by radiologists during image interpretations (G’orgel, 2013). Thus amplifying contrast and removing noise of mammogram images become one of the key objectives. Artificial Neural Networks (ANN) techniques were adopted for breast disease classification (Mehdy, 2017). In order to accomplish contrast enhancement followed
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by removing noise, an approach has been proposed based on Bi-orthogonal Wavelets and Morphological operations. Features necessary for the detection can be extracted using a level dependent soft threshold which separates noise from the image by retaining the valuable information. Presence of calcifications and masses in mammogram images are the main source of abnormalities. They are categorized by the features such as density, size, margin, shape, and contour of the breast. The proposed approach is evaluated by applying it to the images from the archive, Mammographic Image Analysis Society (MIAS). The results are analyzed and evaluated with existing soft threshold techniques: Sure Shrink (SS), Visu Shrink (VS) and Bayes Shrink (BS). The subjective analysis is executed based on radiologist evaluation. Receiver Operating Characteristic (ROC) is drawn for the true positives and the false positives.

Regarding the security aspect of data, a biometric authentication system provides quite a reasonable solution for security because it uses human anatomical or behavioral features for the verification process (Dey, 2013). The multimodal biometric authentication system, which uses a combination of modalities, has advantages over its unimodal counterpart, especially in areas of False Acceptance Rate (FAR) and False Rejection Rate (FRR). Particle swarm optimization (PSO) is a powerful globally accepted evolutionary swarm intelligence method for classification in data mining (Das, 2014). Biomedical signal and information hiding has been written in an easy way to address the need of improvements in data hiding algorithms to ensure authenticity and security of patients’ information (Dey, 2014). The Peak Signal to Noise Ratio (PSNR) of the original signal vs. watermarked signal has to correlate well for better performance. Medical images are extremely precious owing to its importance in diagnosis, education, and research.

Recently, telemedicine applications and remote medical education play an imperative role in the advancement and progressiveness of the healthcare industry.

Featuring extensive coverage on areas such as kinetic knowledge, cognitive analytics, and parallel computing in the field of big data has been explained. In particular, accuracy of results vs. privacy degree, privacy vs. performance, and trust between users are open problems and an approach by integration of peer-to-peer (P2P) with the caching technique and dummies from real queries has been addressed by the author (Yamin, 2018). Trust is actually a matter of feeling with which one feels connected with some persons in the form of multicast groups. Multicast Route Reliability (MRR) is purely a probabilistic function of Cartesian product of past relationships and present moving patterns (Tyagi, 2017). Information and technology revolution has brought a radical change in the way data are collected. The data collected is of no use unless some useful information is derived from it. Therefore, it is essential to think of some predictive analysis for analyzing data and to get meaningful information (Acharjya, 2017). Cloud computing becomes popular to internet users in context of smart city, cloud computing is applicable in different Government, public and private sectors (Sarkar, 2017). Biometric identification is a good candidate technology, which can facilitate a trusted user authentication with minimum constraints on the security of the access point (Mohammed Fouad, 2017). Trust management plays an important role in ubiquitous communication. It helps in decision making and to identify risks (Mhetre, 2016) has been addressed by the author (Borty, 2016).

2. PROPOSED APPROACH

In this approach, bi-orthogonal wavelet is used which has two different wavelets separately for reconstruction and decomposition. To get more desirable decomposition and reconstruction, two different scaling
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