

Foundation and methodologies in computer-aided diagnosis systems for breast cancer detection

ABSTRACT

Breast cancer is the most prevalent cancer that affects women all over the world. Early detection and treatment of breast cancer could decline the mortality rate. Some issues such as technical reasons, which related to imaging quality and human error, increase misdiagnosis of breast cancer by radiologists. Computer-aided detection systems (CADs) are developed to overcome these restrictions and have been studied in many imaging modalities for breast cancer detection in recent years. The CAD systems improve radiologists' performance in finding and discriminating between the normal and abnormal tissues. These procedures are performed only as a double reader but the absolute decisions are still made by the radiologist. In this study, the recent CAD systems for breast cancer detection on different modalities such as mammography, ultrasound, MRI, and biopsy histopathological images are introduced. The foundation of CAD systems generally consist of four stages: Pre-processing, Segmentation, Feature extraction, and Classification. The approaches which applied to design different stages of CAD system are summarised. Advantages and disadvantages of different segmentation, feature extraction and classification techniques are listed. In addition, the impact of imbalanced datasets in classification outcomes and appropriate methods to solve these issues are discussed. As well as, performance evaluation metrics for various stages of breast cancer detection CAD systems are reviewed.

Keyword: Breast cancer; Computer-aided diagnosis system; Segmentation; Feature extraction; Classification