Chapter 55
Breast Cancer Lesion Detection From Cranial-Caudal View of Mammogram Images Using Statistical and Texture Features Extraction

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ABSTRACT

Breast cancer is the most common cancer among women in the world today. Mammography screening gives vital information about normal and abnormal regions. The task is to detect the lesion in mammograms using computer-aided diagnosis techniques. The automated detection of cancer decreases the mortality rate and manual error. In this work, the statistical (mean, variance, skewness, kurtosis, energy and entropy) and tamura features (coarseness, contrast and directionality) were extracted from the Cranial-Caudal (CC) view of mammogram images collected from the M.S. Ramaiah Memorial Hospital, Bangalore. The support vector machine was used for classification. Different support vector machine kernels were used and results were tabulated. The highest accuracy was obtained for linear and quadratic kernels with 95.7% with sensitivity of 100% and specificity of 91%.

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INTRODUCTION

Breast cancer is the second leading cause of death in women. Mortality/Incidence ratio is a unique method to estimate the cancer statistics. In rural areas, the proportion of cancer cases is high due to late diagnosis, lack of screening and treatment facilities (Shreshtha Malvia et al., 2017). India stands third highest in cancer cases next to China and United States and is growing by 4.5 to 5% annually. The mortality rate for breast cancer in India is 1.7 times higher than maternal mortality (Namita Pandey,2018). The National Cancer Registry report of Indian Council of Medical research (ICMR) estimates the breast cancer cases will be 123,634 by the year 2020 (S.Sathiya Devi and S.Vidivelli, 2017).

Breast cancer is the collection of cancerous cells in the breast. Breast cancer usually starts in the milk ducts. Other parts of the body can be affected by breast cancer by metastasis. The change in the breast size, lump presence feeling, change in the texture of the skin and rashes around the nipple are some of the common symptoms of breast cancer. There are four stages in the breast cancer. If the breast cancer is detected in stage 0, it is curable. If it reaches to stage IV, it spreads far away from the breast and this stage is called metastatic stage. There are many screening techniques available today to detect the presence of breast cancer and among them mammography is the standard tool. It uses low energy X-rays for examining the breast and helps in detecting the presence or absence of lesions. The mammogram images are collected in two different views. i.e., Medio Lateral Oblique (MLO) view and Craniocaudal (CC) view. CC view images are captured by placing the breast on cassette and vertical downward x-ray projection is collected. In mammograms, radiologists find the lesions by analyzing the images. Thus, workload increases and results in manual error. The Computer Aided Diagnosis (CAD) tool helps in detecting, segmenting and classifying the lesions easily and accurately. CAD system has been developed to improve the diagnostic accuracy which helps the radiologists and patients. The CAD methods analyses the images and detects the suspicious regions.

The present work focuses on the automated classification of mammogram using CC view. The images were filtered using anisotropic filter and Signal to Noise Ratio (SNR) were calculated. The Tamura features like contrast, coarseness and directionality, statistical features like mean, variance, skewness, kurtosis, energy and entropy were extracted from the mammogram images Support vector machine was used for classifying normal and abnormal images.

BACKGROUND

Many research works have been carried out in the development of computer aided diagnostic techniques for the identification of abnormalities in mammogram images. The methods aimed at classifying the normal and abnormal mammogram images. Many studies have been carried out to show how the CAD techniques help in diagnosing the breast cancer. Different methods were tabulated in Table 1. Many researchers used publicly available database and some have collected from hospital and scanning centers. Texture features, shape features, clustering methods etc. have been used for feature extraction.