Chapter 58

Comparative Analysis of Proposed Artificial Neural Network (ANN) Algorithm With Other Techniques

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ABSTRACT

The mortality rate among women is increasing progressively due to cancer. Generally, women around 45 years old are vulnerable from this disease. Early detection is hope for patients to survive otherwise it may reach to unrecoverable stage. Currently, there are numerous techniques available for diagnosis of such a disease out of which mammography is the most trustworthy method for detecting early cancer stage. The analysis of these mammogram images are difficult to analyze due to low contrast and nonuniform background. The mammogram images are scanned and digitized for processing that further reduces the contrast between Region of Interest and background. Presence of noise, glands and muscles leads to background contrast variations. Boundaries of suspected tumor area are fuzzy & improper. Aim of paper is to develop robust edge detection technique which works optimally on mammogram images to segment tumor area. Output results of proposed technique on different mammogram images of MIAS database are presented and compared with existing techniques in terms of both Qualitative & Quantitative parameters.

INTRODUCTION

The edges are feature points characterizes boundary between two dissimilar objects present in an image. Edge detection is one of the distinguished image processing technique used extensively in many applications like Segmentation, Machine Vision and learning, Analysis, Feature Extraction etc. Edge detection filters relevant information, by preserving crucial structural details. Any edge detection technique copes with various challenges i.e. false positives, Noise, poor contrast and in appropriate thresholding. There exist several edge detectors, but our literature survey confirms that none of them performs optimally on mammogram images for tumor segmentation.

ARTIFICIAL NEURAL NETWORK (ANN)

In recent years, it has also been observed that the artificial neural network (ANN) is used to resolve problems related to complex scenarios and logical thinking. Therefore, this article works investigates the capability of ANN to restore the edge information from the digital mammogram images for the detection of tumor in earlier stages. In this paper, a robust edge detection algorithm based on Artificial Neural Networks is proposed. The first stage of algorithm involves Bilateral filtration and Multi-Thresholding using entropy technique to ensure least loss of details in input image during binarization. This Binary image is disintegrated into 3×3 windows and is applied as an input to a supervised BPNNto determine weights and bias for another feed-forward neural network. Finally, the output of feed-forward neural network is used to detect the presence of edge in input centre pixel of the window.

EVALUATE THE PERFORMANCE OF ANN WITH EXISTING TECHNIQUES

Quantitative Comparison

The Qualitative comparison is basically done by visual inspection. The few parameters which are kept in mind while declaring best technique among different edge detector are: True Edges, Thin Boundaries, Lost detail, Noise and Broken Edges.

TEST IMAGE 1

The Qualitative comparison of Artificial Neural Network (ANN) technique with other existing techniques for test image 1 is shown in Figure 1. It is clear by visual inspection that Artificial Neural Network (ANN) algorithm gives best results among all other competing detectors as it is manifesting maximum accurate tumor details with minimum structural loss. Also, it is observed that there is high continuity among all edge pixels along with almost true and thin edges.

The Quantitative results are color coded to differentiate top three performing technique among others as shown in Table 2.

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