

AbstractID: 2800 Title: Mask-Based Vs. Reverse Engineering-Based Strategies for Skin-line Enhancement in Low Contrast Projection Mammograms

Purpose:

This paper presents two new strategies for skin-line enhancement in mammograms based on brightness preserving bi-histogram equalization (BBHE) [1] framework during window and level process.

Method:

Image enhancement is performed using two different strategies based on BBHE framework: (A) masked-based strategy, and (B) reverse engineering approach. In the first approach, the image is divided into two regions: skin-line zone mask and the rest of the breast region. The skin-line zone mask is computed by subtracting the binary images obtained using two different threshold techniques: whole breast region threshold using Ojala's method [2] and stroma breast region threshold using Otsu's method [3]. The BBHE is then applied in this masked zone and the remaining breast region, thereby boosting the skin-line zone of the mammograms.

The second approach uses the reverse engineering technique where the enhancement is started in the reverse direction from skin-line towards the parenchyma. The bands are taken from the outer region of the breast moving inward. This method is implemented by performing BBHE on a significant band (say 50 pixels wide) on the image and replacing only a small band (say 10 pixels wide) by the enhanced BBHE band. This is repeated until the whole image was enhanced. This method performs very well on mammograms with very low contrast in the skin-line zone.

Results: Both techniques demonstrated a considerable boosting in the skin-line zone, which was the goal of the enhancement process. The lesion conspicuity is improved and skin-line edges are well seen during window level. The algorithm has been tested on 15 MIAS mammograms.

Conclusions: Both implemented methods show enhancement in the skin-line region. We are currently testing its robustness on other mammogram databases.