AbstractID: 2787 Title: An Inward Mammilla Detection Algorithm for Analysis of Skin-line Retraction

Purpose: A specific algorithm is designed for the detection of the mammilla to locate the inward mammilla position along the breast skin-line in mammograms. The position of the inward mammilla can assist in the analysis of focal retraction near the nipple.

Method and Materials: Between the breast skin-line and the fibro-glandular tissue is a zone of fatty peripheral tissue, which appears with low gray-levels on mammograms. Due to the mammary glands connecting to the mammilla, the gray-level in the fatty zone near the mammilla will be higher. We define a fatty peripheral zone (Z_f) of 40 pixels width (8mm) parallel to the skin-line on mammograms. A disk mask of diameter 40 pixels, K_P, tangential to the skin-line boundary point P and rolling in the zone Z_f, is used to obtain a mammilla index value for P. A mammilla index (I_P) for P is defined as the average gray-level of the pixels in both Z_f and the current mask K_p. Then, three highest values, I_{t1} (highest), I_{t2} (second highest), and I_{t3} (third highest), corresponding to position indexes P_{t1}, P_{t2}, and P_{t3} on the skin-line, are found on the curve of I_P. If the differences between P_{t1} and P_{t2}, as well as between P_{t1} and P_{t3}, are larger than a threshold T_1, and the difference between P_{t2} and P_{t3} is less than another threshold T_2, the mammilla position is defined as the average of P_{t2} and P_{t3}; otherwise the mammilla position is defined as P_{t1}. Empirically, we selected T_1=90 and T_2=36.

Results: We have tested our algorithm on 40 mammograms from the MiniMIAS database with inward nipples, and our method achieved accurate detection of the mammilla position on each image.

Conclusion: The proposed algorithm for the detection of the inward mammilla position gave accurate results on the mammograms tested.