Abstract ID: 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.