Mammography Image Analysis to Ease Detection of Microcalcifications

Mitra, Prachatos

Roy, Shailpik

White’s illusion defies the Standard Lateral Inhibition theory used to explain Simultaneous Brightness Contrast illusion. These two contradictory grayscale optical illusions have been unified using a common theory which states that the illusion occurring in a given grayscale picture depends on the ratio of the higher of the number of white and black cells (in the image matrix) to the lower surrounding a patch. These illusions play a significant role in image segmentation; knowing which illusion can occur in which case, the appropriate effect of the illusion can be utilized to ease analysis of medical images, such as mammography pictures. Microcalcifications in mammography images may indicate ductal carcinoma in situ (DCIS) and are difficult to detect due to masking by the breast tissue and lesions. An algorithm was developed which can process a grayscale mammography picture and determine the regions of interest (microcalcifications). The algorithm can also determine which illusion will occur in such regions using the proposed theory and accordingly calculate the perceived grayscale values of the picture. The algorithm thereafter offers the option of enhancing the regions of interest using either Simultaneous Brightness Contrast illusion or White’s illusion. The results were compared to two standard mammography image enhancement filters, Unsharp Masking and Histogram Equalization by radiologists and the proposed algorithm was adjudged more helpful for identifying microcalcifications in 84% of the cases. The average Contrast Improvement Index was 25% for the 100 test images processed. The exact nature of the algorithm and the results on mammography pictures is discussed.

Awards Won: