

Abstract

Breast cancer has become the leading cause of cancer deaths among women in developed countries including Thailand. To decrease the related mortality, the disease must be treated as early as possible. However, it is hard to detect and diagnose tumors at an early stage. A well-designed computer aided diagnostic system can help physicians to avoid misdiagnosis and unnecessary biopsy without missing cancers. Ultrasonography provides a criterion that helps the physicians to decide whether a certain solid tumor is benign or malignant. However, it is one of the most difficult types of images to assess.

This project offers a new approach to segmentation of ultrasound images of the breast tumors based on the active contour method combined with a new vector field analysis technique. The technique includes a new iterative procedure based on the phase portrait analysis, vector projection and vector entropy approach. The first method is determined to find the different between the edge of tumor and the background. It is based on phase portrait algorithm. The ratio of eigen values that represent the sub-matrix of image is the classifier. Second method called vector projection is used to analyze the vector characteristic. The third method is called vector entropy algorithm. It uses the entropy theory apply to the angle of the vectors to distinguish between edge vector and noise vector.

The proposed techniques were tested with a set of real US breast tumor images with a set of ground truth images hand-drawn by radiologists. The numerical results show that the several methods of vector field analysis combined with the active contour outperforms the conventional GGVF snakes. Our numerical experiments display an advantage of the proposed techniques. The proposed algorithm is compared with conventional edge detectors. The numerical experiments show that these three techniques lead to a better segmentation accuracy (more than 90%) with low error.