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Applying Genetic Algorithms to Optimise Breast Ultrasound Images Segmentation Procedure Based on Morphological Operators

Andre Alvarenga[a], Wagner Pereira[b], Antonio Infantosi[b] and Carolina Azevedo[c]
[a]Laboratory of Ultrasound - Inmetro, Av. N. Sra. das Gracas, 50, predio 1 - Xerem, 25250-020 Duque de Caxias - Rio de Janeiro, Brazil
[b]Biomedical Engineering Program - COPPE, Federal University of Rio de Janeiro, CEP. 21.941-972 Rio de Janeiro, Brazil
[c]Brazilian National Cancer Institute - INCa, Praça da Cruz Vermelha, 23, 20230-130 Rio de Janeiro, Brazil

Ultrasound (US) image segmentation is a complex problem due its textural nature. To address this difficulty, different segmentation procedures have been described to support radiologists in recognising abnormal US-image areas. This work proposes a procedure, based on Genetic Algorithms (GA) and Morphological Operators (MO), to segment breast tumours on ultrasound images. Each chromosome represents a complete image processing sequence, composed of MOs and structuring elements (SE). The GA generates 500 chromosomes of 93 genes, where the three first genes summed indicate the number of performed operations, the following 45 genes represent the operations' sequence, and the last 45, the SE-disk diameter (in pixel). The best segmentation sequence (best chromosome) is selected using an objective function, based on the weighted sum of the number of false-positive and false-negative pixels. The gold standards are the tumour contours depicted by an experienced radiologist. Twenty images are used to train the GA procedure, and the best chromosome tested with 40 different images. The performance of the procedure is assessed using the overlap ratio among the obtained segmentation and the gold standard. All tested images present an area overlap ratio superior to 70%. This initial result encourages us to go further by increasing the number of images.