Prostate boundary detection in ultrasound images using biologically-inspired spiking neural network

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Abstract

Pulse-coupled neural networks (PCNNs) are a biologically inspired type of neural networks. It is a simplified model of the cat's visual cortex with local connections to other neurons. PCNN has the ability to extract edges, segments and texture information from images. Only a few changes to the PCNN parameters are necessary for effective operation on different types of data. This is an advantage over published image processing algorithms that generally require information about the target before they are effective. The main aim of this paper is to provide an accurate boundary detection algorithm of the prostate ultrasound images to assist radiologists in making their decisions. To increase the contrast of the ultrasound prostate image, the intensity values of the original images were adjusted firstly using the PCNN with median filter. It is followed by the PCNN segmentation algorithm to detect the boundary of the image. Combining adjusting and segmentation enable us to eliminate PCNN sensitivity to the setting of the various PCNN parameters whose optimal selection can be difficult and can vary even for the same problem. The experimental results obtained show that the overall boundary detection overlap accuracy offered by the employed PCNN approach is high compared with other machine learning techniques including Fuzzy C-mean and Fuzzy Type-II.

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