A Fully Automatic Prostate Segmentation in MR Images Using a New Hybrid Active Contour Based Approach

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Abstract- Precise prostate segmentation in the magnetic resonance (MR) images is mostly utilized for prostate volume estimation, which can help determine the density of prostate-specific antigen (PSA). In this paper, we present a fully automatic method with three successive steps for prostate segmentation of MR images. The approach includes a preprocessing stage, an automatic initial point generation step and an algorithm contour based with an external force, known as vector field convolution (VFC). At first, both noise and roughness are approximately removed using Sticks filter and morphology smoothing. In the second step, an initial point is automatically generated using multilayer trained perceptron neural network (NN) to initiate the segmentation algorithm. In the next step, VFC is employed to extract the prostate region. This system was applied to a series of test images to detect prostate boundaries. The evaluated results indicate that the proposed method can quickly and robustly segment the prostate region compared with previous methods. To evaluate the proposed method, the prostate region was extracted from a series of T2-weighted MR images as provided by the Prostate MR Image Segmentation 2012 (PROMISE12) challenge. The mentioned paper is under review in Signal, Image and Video Processing.