Abstract

Delineation of anatomic structures on CT images, although a difficult and time-consuming task, is an essential component in radiotherapy treatment planning. Automatic delineation of anatomic structures has previously been based primarily on thresholding of CT pixel values. A structure delineation algorithm using wavelet-based denoising and edge detection has been developed and tested to delineate boundaries of the urinary bladder. Several denoising techniques were evaluated. A redundant denoising technique has been found to generate less noisy images than those denoised via non-redundant denoising. Images denoised by a Haar wavelet and hard thresholding constant over scales were used for segmentation studies. Following image denoising, each row and column of the denoised image was convolved with a Haar wavelet. Local maxima/minima were thresholded to extract edges corresponding to boundaries of anatomic structures. Twelve CT slices of the pelvis with 1-cm separation were used to delineate the outline of the bladder. The boundary between the bladder and the surrounding structure was found to be well defined in eight slices. In the remaining four slices, overlap of the bladder and seminal vesicles precluded complete delineation of the bladder. Complete delineation in all CT images is likely to require additional segmentation techniques.