AbstractID: 2107 Title: Alignment of vessels trees segmented from coronary angiographic sequences

For fully automated vascular analysis, vessels must be identified throughout angiographic sequences. In addition, vessel branching hierarchy determination can be facilitated when correlations are established throughout the sequence. As a first step for this analysis, we have developed an automated method for alignment of vessel segments in temporal sequences using rigid body translations and rotations. After image sequence acquisition, vessels in temporally adjacent images are aligned as follows. The vessels are segmented from the background in each image. The centers of mass of the segmented vessel pixels in the images are calculated. The later image is shifted to align the centers of mass. For each image, an angular parameter is calculated using the arctangent of a weighted sum of the x and y coordinates of the segmented vessel pixels. The later image is then rotated by the difference of this angular parameter to align the vessel trees. Alignment accuracy was assessed using the percent overlap between vessels in the earlier and aligned, later images. Evaluations were performed using simulated and clinically-obtained vessel trees. For rotations of up to 40^{o}, angular alignment errors were less than 1^{o}. The aligned vessels overlapped the vessels in earlier images by more than 85% and 70% for simulated and clinical images, respectively. We have developed a simple method, using only one translation and rotation, to align vessel trees in coronary sequences. This method will be useful for temporal tracking of vessel trees and their hierarchical relationships.

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