

Automatic Labeling of Coronary Artery Tree in CCTA Datasets

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Coronary computed tomographic angiography (CCTA) is a non-invasive imaging modality for the diagnosis of coronary artery disease. An automatic labeling algorithm which assigns coronary arteries with their anatomical names facilitates the diagnosis work-flow for radiologists and cardiologists. It is also a prerequisite step in a computer-aided diagnosis system for CCTA datasets. In this paper, an automatic coronary tree labeling algorithm is developed for annotating the extracted branches with their anatomical names for CCTA datasets. A two-step matching algorithm is implemented by means of a statistical coronary tree model. First, in order to identify the main branches in the extracted coronary tree, the three main branches in the model, i.e. LAD, LCx and RCA, are aligned with the extracted coronary centerlines by a rigid registration method. Second, all the segments including proximal, middle and distal parts of the main branches and all side-branches in the coronary tree model are matched with their candidates in the extracted coronary tree. The matching cost values are calculated for all the possible matching results and the minimum cost determines the optimal labeling. Some clinical criteria from the cardiology department are employed then to generate the final result. Since currently we only have a right-dominant coronary tree model, 58 CCTA datasets with right-dominant coronary trees were used in the evaluation. The automatic labeling results were corrected manually by an expert from the cardiology department first. Then, the differences between the automatic and corrected results were calculated. In total, 890 segments were labeled by the automatic labeling algorithm. Within these segments, the labels of 51 (5.73%) segments were edited by the expert. For the other 839 segments, the average overlap between automatic and expert results was 92.8%. In conclusion, we developed an automatic labeling algorithm for CCTA datasets which had a high labeling accuracy.