4D Model Reconstruction of Patient-Specific Cardiac Mesh from Segmented Contour Lines

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We propose an automatic algorithm for the reconstruction of a set of patient-specific dynamic cardiac mesh model with 1-to-1 mesh correspondence over the whole cardiac cycle. This work focus on both the reconstruction technique of the initial 3D model of the heart and also the consistent mapping of the vertex positions throughout all the 3D meshes. This process is technically more challenging due to the wide interval spacing between MRI images as compared to CT images, making overlapping blood vessels much harder to discern. We propose a tree-based connectivity data structure to perform a filtering process to eliminate weak connections between contours on adjacent slices. The reconstructed 3D model from the first time step is used as a base template model, and deformed to fit the segmented contours in the next time step. Our algorithm has been tested on an actual acquisition of cardiac MRI images over one cardiac cycle.

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