
Cardiac Motion Analysis using Transport Distance

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Abstract

Dynamic time warping (DTW) aligns temporal image sequences. Wasserstein distance (WD) computes transport of grey-values (TG) between images. TG allows us to match images without computing geometric correspondences among images. By combining DTW and TG, we develop a method to align volumetric temporal sequences and to track temporal transport in a sequence. By applying the method to a pair of sequences, the method detects the temporal differences of cardiac motion of a pair. Furthermore, by applying the method to a sequence, the method tracks the temporal fluctuations in a sequence. Numerical examples show the method aligns sequences of temporal volumetric MRI heart images and tracks the motion of heart valves and heart wall in MRI temporal image sequences. Therefore, these results show that changing on appearances of grey-values of images corresponds to anatomical motion of organs. The method separates the heart wall and blood flow of inside of heart using grey-value transport along a temporal sequence.

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