Curvature, divergence, and confluence constraints for vessel trees

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Abstract

We are interested in *unsupervised* reconstruction of complex near-capillary vasculature with thousands of bifurcations where supervision and learning are infeasible. This talk discusses regularization algorithms for accurate reconstruction of such directed trees using novel formulations modeling the centerline curvature. the tree divergence pattern (arteries or veins), and vessels confluence. Our models regularize a directed Tubular Graph where the minimum arborescence represents our directed tree reconstruction. We are focused on the accuracy of bifurcations and the overall topology of the tree. Our results are validated on synthetic 3D data with ground truth and real data - large resolution Microscopy CT of the whole cardiac vasculature (of mice).

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