A Network Based Approach for Unbalanced Optimal Transport on Surfaces

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Abstract: In this report, we present a neural network approach to address the dynamic unbalanced optimal transport problem on surfaces with point cloud representation. For surfaces with point cloud representation, traditional method is difficult to apply due to the difficulty of mesh generating. Neural network is easy to implement even for complicate geometry. Moreover, instead of solving the original dynamic formulation, we consider the Hamiltonian flow approach, i.e. Karush–Kuhn–Tucker system. Based on this approach, we can exploit mathematical structure of the optimal transport to construct the neural network and the loss function can be simplified. Extensive numerical experiments are conducted for surfaces with different geometry. We also test the method for point cloud with noise, which shows stability of this method. This method is also easy to generalize to diverse range of problems.