
Dynamic Isoperimetry on Weighted Manifolds

Eric Kwok*¹

¹School of Mathematics and Statistics (UNSW) – Australia

Abstract

Transport and mixing in dynamical systems are important mechanisms for many physical processes. We consider the detection of transport barriers using a recently developed geometric technique [1]: the dynamic isoperimetric problem. Solutions to the dynamic isoperimetric problem are sets with persistently small boundary size relative to interior volume, as the sets are evolved by the dynamics. In the presence of small diffusion these sets have very low dispersion over finite-times because of their lasting small boundary size, and thus are natural candidates for coherent sets, bounded by transport barriers.

We construct a weighted dynamic Laplacian operator, and show corresponding results for a dynamic Cheeger inequality and dynamic Federer-Fleming theorem. We can handle general nonlinear dynamics, and weighted versions of area and volume. Finally, we formulate the connection between the present geometrical approach to recent probabilistic approaches to determining coherent sets using transfer operators.

1. G. Froyland “Dynamic Isoperimetry and the geometry of Lagrangian coherent structures”.

*Speaker