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Hydrodynamic limit of particle systems on resistance spaces

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The aim of my talk is to describe an ongoing program establishing the scaling limits of particle systems on resistance spaces, which are motivated by hydrodynamic problems on irregular domains. These spaces include scaling limits of trees, fractals, and random graphs which are bounded in the resistance metric. The particle system of interest is the (weakly asymmetric) exclusion process, with or without boundary-driving terms.

In order to establish the hydrodynamic limit there are several key steps, each of which I will sketch in some detail.

- An energy inequality for the exclusion process on a finite weighted graph.
- A local ergodicity (coarse-graining) theorem which facilitates the passage from microscopic spins to macroscopic averages. (This uses 1) and some basic estimates from random walks and harmonic analysis on graphs.)
- Analysis of the corresponding limiting PDE, a nonlinear heat equation.

It is unclear whether this program can be extended to the strongly/totally asymmetric exclusion process on resistance spaces. Ideas and suggestions are very welcome.

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