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Thermodynamic formalism for symbolic open systems via singular perturbations

This minicourse will be primarily based on my book *Open Dynamical Systems: Statistics, Geometry, and Thermodynamic Formalism*, joint with Tushar Das, Giulio Tiozzo, and Anna Zdunik. The starting dynamical system will be given by any countable alphabet finitley primitive subshift of finite type and the invariant Gibbs state of a 1-cylinder summable Hölder continuous potential φ. The holes defining open systems will be then formed by collections of open sets with appropriately defined thin boundaries. They will naturally lead to singularly perturbed transfer operators associated to the potential φ.

The course will develop conditionally invariant measures and surviving sets. The surviving variational principle, the existence and uniqueness of surviving equilibrium states, the asymptotic of perturbed leading eigenvalues, and escape rates when holes approach a given hole will be discussed. The logarithms of leading perturbed eigenvalues will turn out to be equal to topological pressures defined be means of surviving variational principle. Also stochastic properties of surviving equilibria such as exponential decay of correlation and the the Central Limit Theorem will be discussed. All these objects will be produced and studied in our dynamical setting by means and applications of the Keller–Liverani Perturbation Theorem.

Applications to "real" systems will be also mentioned. In such a context in Euclidean spaces the holes giving rise to open systems can be take to be virtually any Euclidean balls; in particular not being dynamically defined like for example unions of cylinders of the same length. Examples will be given.