Escape Rate for Maps with Holes

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Abstract

Given a *(closed)* dynamical system $f : M \to M$ on a compact manifold M, we can introduce a hole $H \subset M$ in order to study the *open* system $f : M \backslash H \to M$, where the *phase space* is not invariant. In this case, we define the *(exponential)* **escape rate** as

$$\mathcal{E}(f, m, H) = -\lim_{n \to \infty} \frac{1}{n} \log m\Big(\cap_{j=0}^{n-1} f^{-j}(M \backslash H) \Big),$$

for a reference measure m, where $\cap_{j=0}^{n-1} f^{-j}(M \backslash H)$ is the set of points that never “fall” into the hole up time n.

In the case of **Collet-Eckmann maps** on the interval, *M. Demers and M. Todd (2014)* show that this limit exists and provide a relation between the *escape rate* and the *pressure*, when the reference measure is *conformal* with respect to the *geometric potentials*.

For **Viana maps**, we have shown that there exists an *induced scheme that respects a hole of a certain type*. Now, our goal is to show that there are conformal measures for the geometric potentials as well as the escape rate is well-defined with respect to them.