Generalized robustness of abstract dynamical systems

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Abstract

We study the modification of the statistical properties in the large time limit of dynamical systems caused by small perturbations. The dynamical systems are modelled by measure preserving transformations of finite or infinite Lebesgue measure spaces. We study the effects of small perturbations of the law of the evolution as well as of the invariant measure. The perturbations of the initial invariant measure are obtained by replacing the unperturbed measure by an equivalent invariant measure. The large time statistical properties of the dynamical system are encoded in the projector on the invariant states. The robustness is defined in the term of the continuity, in strong operator topology, of the projector on the invariant states when the invariant measure and the dynamical laws are slightly perturbed. We prove that in finite measure case from ergodicity results robustness. In the infinite measure case the dynamical system is robust if the single invariant function is zero. The motivations of the definitions and of the consequences of the results are discussed from the point of view of physical applications to the particle transport in tokamak.