Asymptotic distributions in dynamical systems : Gaussian laws and other laws

Abstract

The two basic limit theorems in Probability Theory, the law of large numbers (LLN) and the central limit theorem (CLT), have their counterparts in Ergodic Theory, since Birkhoff's Theorem in 1931 for the LLN, much later for the CLT. It is mainly from the beginning of the years '60, with results of Sina on the geodesic flow, that examples of smooth dynamical systems begin to appear in the literature where a CLT can be obtained for classes of regular functions. These systems are of hyperbolic type. There are few known examples where a nonstandard asymptotic distribution can be shown.

We will try to explain why it is so and we will give an example of application of the CLT : the recurrence of dispersive billards with periodic obstacles in the plane.

Finally we will present some recent results with non standard laws, in particular examples given by Sebastien Gouezel of weakly hyperbolic systems for which stable nonGaussian laws are valid.