Lorentz Process with shrinking holes in a wall

Péter Nándori
Department of Stochastics,
Budapest University of Technology and Economics,
nandori@math.bme.hu

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The periodic Lorentz process is a fascinating non-linear, chaotic dynamical system that has been deeply investigated in the last decades. The model is very simple: a massless point particle moves freely in the plane (or in our case, in a strip) until it hits one of the periodically situated smooth convex scatterers, when it is reflected. The limit of the diffusively scaled trajectory of the particle is known to be the Brownian motion. Further, if the particle is restricted to a half strip, then the scaling limit is going to be the so-called reflected Brownian motion. Here we introduce a *time-dependent scatterer configuration* (by adding a vertical wall with a shrinking hole) that almost confines the particle to the half strip in such a way that the scaling limit is a *quasi-reflected Brownian motion*. This process is Markovian but not strong Markovian and is a natural generalization of both the Brownian motion and the reflected Brownian motion. Local time results for the periodic Lorentz process, having independent interest, are also found and used.
In this talk, we present the results of the preprint P. Nándori, D. Szász: Lorentz Process with shrinking holes in a wall (to appear in *Chaos: An Interdisciplinary Journal of Nonlinear Science*). The results discussed above are supported by the grant TÁMOP - 4.2.2.B-10/1–2010-0009.