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Diffusion with Optimal Resetting

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(Submitted on 21 Jul 2011 (v1), last revised 24 Jul 2011 (this version, v2))

We consider the mean time to absorption by an absorbing target of a diffusive particle with the addition of a process whereby the particle is reset to its initial position with rate r. We consider several generalisations of the model of M. R. Evans and S. N. Majumdar (2011), Diffusion with stochastic resetting, Phys. Rev. Lett. 106, 160601: (i) a space dependent resetting rate $r(x)$ ii) resetting to a random position z drawn from a resetting distribution ${\cal P}(z)$ iii) a spatial distribution for the absorbing target $P\_T(x)$. As an example of (i) we show that the introduction of a non-resetting window around the initial position can reduce the mean time to absorption provided that the initial position is sufficiently far from the target. We address the problem of optimal resetting, that is, minimising the mean time to absorption for a given target distribution. For an exponentially decaying target distribution centred at the origin we show that a transition in the optimal resetting distribution occurs as the target distribution narrows.

Comments:	17 pages, 2 figures, submitted to J. Phys. A: Math. Theor, abstract corrected
Subjects:	**Statistical Mechanics (cond-mat.stat-mech)**; Mathematical Physics (math-ph)
Cite as:	**arXiv:1107.4225v2 [cond-mat.stat-mech]**

Submission history

From: Martin Evans [view email]
[v1] Thu, 21 Jul 2011 10:16:55 GMT (38kb)
[v2] Sun, 24 Jul 2011 11:06:31 GMT (38kb)

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