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Mathematical Physics

An anti-symmetric exclusion process for two particles on an infinite 1D lattice

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(Submitted on 11 Jul 2011 (v1), last revised 10 Oct 2011 (this version, v2))

A system of two biased, mutually exclusive random walkers on an infinite 1D lattice is studied whereby the intrinsic bias of one particle is equal and opposite to that of the other. The propagator for this system is solved exactly and expressions for the mean displacement and mean square displacement (MSD) are found. Depending on the nature of the intrinsic bias, the system's behaviour displays two regimes, characterised by (i) the particles moving towards each other and (ii) away from each other, both qualitatively different from the case of no bias. The continuous-space limit of the propagator is found and is shown to solve a Fokker-Planck equation for two biased, mutually exclusive Brownian particles with equal and opposite drift velocity.

Submission history

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