Abstract for Dynamics Days Crete 2006

Topic: Other

Diffusion on regular lattices

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We consider two types of motion, one with particle occupying only the sites on a given regular lattice and another when the bonds between neighboring lattice sites are displaced to the positions of the neighboring bonds. We refer to these models as site- and bond-diffusion. The latter is equivalent to site-diffusion on a lattice constructed from the middle points on each bond of the original lattice. The transition probability is assumed equal to all neighboring positions. The distribution of displacements from the starting points tends toward Gaussian at infinity, thus implying normal diffusion. Kurtosis excess is calculated with the periodic orbit theory for site-diffusion on square and $(4, 8^2)$-lattice, to estimate the deviation of the distribution of displacements from the Gaussian. The diffusion constant is obtained by using the same theory for all Archimedean lattices, as well as some three-dimensional lattices (cubic, diamond, body centered cubic and face centered cubic lattice). It is also studied deterministic motion over the honeycomb lattice without the possibility for an immediate return to the preceding node, controlled by a tent map with the golden ratio slope. Every single step of bond-motion is expressed through two site-motion steps. Analytic results for the diffusion constant for bond-diffusion for square, triangular and Kagomé lattice are also obtained. All theoretical results are verified with numerical simulation. Part of the results are published in [1].

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[1] L. Basnarkov and V. Urumov, *Phys. Rev.E* **73**, 046116, (2006).