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Cluster-Resolved Dynamic Scaling Theory and Universal Corrections for Transport on Percolating Systems

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Abstract

For a continuum percolation model, it has been shown recently that the crossover from pure subdiffusion to normal diffusion extends over five decades in time [1, 2]; in addition, the asymptotic behavior is slowly approached and the large corrections cannot simply be ignored. Thus, it is of general interest to develop a systematic description of universal corrections to scaling in percolating systems. For percolating systems, we propose a universal exponent relation connecting the leading corrections to scaling of the cluster size distribution with the dynamic corrections to the asymptotic transport behavior at criticality. Our derivation is based on a cluster-resolved scaling theory unifying the scaling of both the cluster size distribution and the dynamics of a random walker.

We corroborate our theoretical approach by extensive simulations for a site percolating square lattice and numerically determine both the static and dynamic correction exponents [3].

References

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