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Abstract

This paper considers ensembles of general, independent and identically distributed, random walks. Taking the ensemble-size to grow infinitely large, and also taking the running-time of the random walks to grow infinitely large, universal Poisson-process limits are obtained. Specifically, it is established that the positions of general linear random walks converge universally to Poisson processes, over the real line, with uniform and exponential intensities. And, it is established that the positions of general geometric random walks converge universally to Poisson processes, over the positive half-line, with harmonic and power intensities. Corollaries to these universal convergence results yield the extreme-value statistics of Gumbel, Weibull, and Frechet.

Keywords: random walks; universal convergence; Poisson processes; power statistics; selfsimilar motions; Levy noises.

PACS: 02.50.-r (probability theory, stochastic processes, and statistics); 05.40.-a (fluctuation phenomena, random processes, noise, and Brownian motion); 05.40.Fb (random walks and Levy flights).

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