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2.11 Nonchaotic system with fractal attractor: time course2.8 Ubiquity of Fractal Behavior; Problems; 3 Point Processes: Definition and Measures; 3.1 Point Processes; 3.2 Representations; 3.1 Point-process representations; 3.3 Interval-Based Measures; 3.2 Rescaled-range analysis: pseudocode; 3.3 Rescaled-range analysis: illustration; 3.4 Detrended fluctuation analysis: pseudocode; 3.4 Count-Based Measures; 3.5 Detrended fluctuation analysis: illustration; 3.6 Construction of normalized variances; 3.5 Other Measures; Problems; 4 Point Processes: Examples; 4.1 Homogeneous Poisson Point Process
4.2 Renewal Point Processes4.3 Doubly Stochastic Poisson Point Processes; 4.1 Stochastic-rate point processes; 4.4 Integrate-and-Reset Point Processes; 4.5 Cascaded Point Processes; 4.2 Cascaded point process; 4.6 Branching Point Processes; 4.7 Levy-Dust Counterexample; Problems; 5 Fractal and Fractal-Rate Point Processes; 5.1 Measures of Fractal Behavior in Point Processes; 5.2 Ranges of Power-Law Exponents; 5.3 Relationships among Measures; 5.4 Examples of Fractal Behavior in Point Processes; 5.1 Representative rate spectra; 5.2 Representative normalized Haar-wavelet variances
5.5 Fractal-Based Point Processes5.3 Normalized Daubechies-wavelet variances; 5.4 Fractal and nonfractal point processes; 5.5 Fractal-rate and nonfractal point processes; Problems; 5.6 Estimated normalized-variance curves; 5.7 Representative interval spectra; 5.8 Representative interval wavelet variances; 5.9 Representative interevent-interval histograms; 5.10 Representative capacity dimensions; 5.11 Generalized dimensions for an exocytic point process; 6 Processes Based on Fractional Brownian Motion; 6.1 Fractional Brownian Motion; 6.1 Realizations of fractional Brownian motion
6.2 Fractional Gaussian Noise

Sommario/riassunto

An integrated approach to fractals and point processesThis publication provides a complete and integrated presentation of the fields of fractals and point processes, from definitions and measures to analysis and estimation. The authors skillfully demonstrate how fractal-based point processes, established as the intersection of these two fields, are tremendously useful for representing and describing a wide variety of diverse phenomena in the physical and biological sciences. Topics range from information-packet arrivals on a computer network to action-potential occurrences in a neural