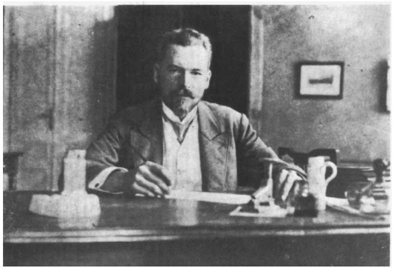

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Fractional Brownian motion with random Hurst exponent

Monday, 19 September 2022 15:00 (45 minutes)

Fractional Brownian motion, a Gaussian non-Markovian self-similar process with stationary long-correlated increments, has been identified to give rise to the anomalous diffusion behavior in a great variety of physical systems. The correlation and diffusion properties of this random motion are fully characterized by its index of self-similarity, or the Hurst exponent.
However, recent single particle tracking experiments in biological cells revealed highly complicated anomalous diffusion phenomena that cannot be attributed to a class of self-similar random processes. Inspired by these observations, we here study the process which preserves the properties of fractional Brownian motion at a single trajectory level, however, the Hurst index randomly changes from trajectory to trajectory. We provide a general mathematical framework for analytical, numerical and statistical analysis of fractional Brownian motion with random Hurst exponent. The explicit formulas for probability density function, mean square displacement and autocovariance function of the increments are presented for three generic distributions of the Hurst exponent, namely two-point, uniform and beta distributions. The important features of the process studied here are accelerating diffusion and persistence transition which we demonstrate analytically and numerically.

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