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Natural time analysis: An overview.

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Natural time, first brought forward a decade ago [1,2], has been recently reviewed [3]. It enables the identification of novel dynamical features hidden behind the time series of complex systems. Upon employing natural time, modern techniques of statistical physics in time series analysis (for example, Hurst analysis, the detrended fluctuation analysis, multifractal detrended fluctuation analysis, wavelet transform etc.) yield improved results.

Natural time analysis has been shown to extract the maximum information possible in the study of the dynamical evolution of a complex system. It identifies when a system enters a critical stage. Hence, it plays a key role in predicting catastrophic events in general. We review a series of such examples including the analysis of avalanches of the penetration of magnetic flux into thin films of high Tc superconductors, the identification of sudden cardiac death risk, the recognition of electric signals that precede earthquakes and the determination of the time of an impending mainshock. In particular, we review cases of major earthquakes that occurred in Greece[4-7] and California[6-8] as well as discuss more recent results.

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