THE PHASOR APPROACH TO STEP-SIZE DISTRIBUTION ANALYSIS

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We propose a novel method to investigate the active and passive transport of biologically relevant particles, e.g. membrane proteins. It is based on the phasor approach to fluorescence lifetime imaging, that is here modified and extended to analyze cumulative distribution functions arising from single molecules or ensemble techniques such as single particle tracking (SPT) or image correlation spectroscopy (ICS), respectively. A general theoretical framework able to take into account several stochastic processes is here developed. In addition to accurately retrieving dynamical parameters (e.g. diffusion coefficient, velocity), phasors allow us to overcome the time resolution limit and to therefore detect the dynamics from a single cumulative distribution function without any a priori assumption. The method is validated with simulations of particles undergoing several types of two-dimensional (2D) motions (i.e. diffusion, anomalous and normal diffusion, confined motion, active transport and intermittent transport).