973-Pos
Optimal Estimation of the Diffusion Coefficient from Noisy Time-Series Measurements

Christian L. Vestergaard1, Paul Blainey2, Xiaoliang Sunney Xie3, Jan C. Behrends1

1Technical University of Denmark, Kgs. Lyngby, Denmark, 2Stanford University, Stanford, CA, USA, 3Harvard University, Cambridge, MA, USA.

Single-molecule time-lapse measurements of diffusing proteins often contain considerable localization error. The standard method for estimating the diffusion coefficient is based on the mean square displacements. This method is highly inefficient, since it ignores the high correlations inherent to these. A Generalized least squares method, which takes into account these correlations, is presented and it is shown that it attains the maximum precision possible according to information theory. The method is demonstrated on data from high-speed time-lapse photography of the hOgg1 repair protein diffusing on DNA.

974-Pos
Adaptive Platform for Highly Parallel Low-Noise Recordings of Single Membrane Proteins

Gerhard Baaken1, Srujan Kumar Dondapati1, Juergen Ruehe2, Jan C. Behrends1

1Technical University of Denmark, Kgs. Lyngby, Denmark, 2Stanford University, Stanford, CA, USA.

Optimal Estimation of the Diffusion Coefficient from Noisy Time-Series Measurements

Measurements

Optical Torque Wrench for Single Molecule Studies

Francesco Pedaci, Sven Klijnhost, Maarten van Oene, Jacob W.J. Kerssemakers, Nynke I. Dekker.

TU Delft, Delft, Netherlands.

At the molecular level, the torque applied to biopolymers plays a central role in many processes involving their conformational changes and interactions with proteins. In this method, we will study the torque-sensitivity of individual nucleic acid molecules and their interactions with proteins using a novel optical tweezers configuration termed the optical torque wrench [1].

In standard single-molecule techniques, torque cannot be simultaneously controlled and detected, in contrast with the case of the applied force. With this new technique we will be able to control both parameters in real-time in single molecules of DNA or RNA, with high temporal (250 kHz) and spatial (nm) resolution typical of optical tweezers. Here we present a first characterization of our instrument.

This will allow us to acquire fundamental insight into the torque-sensitivity and dynamics of nucleic acids, DNA packaging, polymerase activity in DNA replication or transcription, and related biological processes.