

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Hidden Markov Analysis of Tethered Particle Motion PHIL NELSON, JOHN BEAUSANG, Univ Penn — Tethered particle experiments use light microscopy to measure the position of a micrometer-sized bead tethered to a microscope slide via a micrometer length polymer, in order to learn about the behavior of the invisible polymer. Currently, this method is being used to measure rate constants of DNA loop formation and breakdown mediated by repressor protein that binds to the DNA. We report a new technique for measuring these rates using a modified hidden Markov analysis that directly incorporates the diffusive motion of the bead, which is an inherent complication of tethered particle motion because it occurs on a time scale between the sampling frequency and the looping time. We compare the looping lifetimes found with our method, which are consistent over a range of sampling frequencies, to the lifetimes obtained via the traditional threshold-crossing analysis, which vary depending on how the raw data are filtered. Our method does not involve filtering, and so is able to detect short-lived looping events and sudden changes in looping behavior.

Phil Nelson
Univ Penn

Date submitted: 18 Nov 2006

Electronic form version 1.4