Mathematical Models for Molecular Motors: The Polymerization Ratchet

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Abstract:

Molecular motors are proteins inside the cell that generate forces and cause the transport of material. The classic examples of molecular motors are myosin, which is responsible for muscle contraction, and kinesin, which is responsible for the transport of cellular materials such as mitochondria and mRNA. Myosin and kinesin both move along polymer tracks, composed of actin filaments and tubulin microtubules respectively. The dynamics of the one-dimensional polymer tracks themselves also play important roles in cell motility. One motivating example is the actin-polymerization-driven motion of the bacteria *Listeria monocytogenes*. In this talk, a mathematical model for a polymerization "ratchet" system will be introduced. Simulation techniques and some analytical results for the ratchet model will be discussed.