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Estimating currents in totally asymmetric simple exclusion process with extended particles and inhomogeneous hopping rates.[1] R.K.P. ZIA, Virginia Tech, JIAJIA DONG, Hamline University, B. SCHMITTMANN, Virginia Tech — Motivated by translation in protein synthesis, we study the totally asymmetric simple exclusion process with extended particles transported along a 1-D lattice with (quenched) inhomogeneous hopping rates. The particles model ribosomes, the lattice models sequences of codons, and the hopping rates reflect the aa-tRNA concentrations. Taking the latter from data for real *E.Coli* genes, Monte Carlo simulations allow us to find the steady state currents, associated with protein production rates. An application would be to predict the effects of "silent mutations" in biological systems. In such mutations, one or more codons are replaced by others which code for the *same* amino-acid, so that the *same* protein (amino-acid chain) is synthesized by a different sequence of codons. However, the rate of production (the overall current), which depends on the details of sequence, will differ. We aim to predict the changes in these currents for all possible silent mutations. Beyond this application, this study of "quenched distribution of distributions" is expected to have far reaching implications in other areas of physics.

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