Title: DERIVATION OF STOCHASTIC BIASED AND CORRELATED RANDOM WALK
MODELS

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Abstract:
In biased and correlated random walk BCRW) models, the transport is characterized by
correlated successive step orientations with a local directional
bias and are useful, for example, in animal movement studies.
Deterministic BCWR models may be used to estimate mean animal densities.
In the present investigation, stochastic versions of BCRW models
are derived for one, two, and three dimensions which have the form of
stochastic partial differential equations (SPDE). Discrete time stochastic
models are first developed by determining the possible changes in direction
for a small time interval. As the time interval decreases, the discrete
stochastic models lead to systems of ItÆo stochastic differential equations.
As the position intervals decrease, stochastic partial differential equations
are derived to model BCRW in one, two, and three dimensions. Comparisons
between numerical solutions of the stochastic partial differential
equations and independently formulated Monte Carlo calculations support
the accuracy of the derivations.