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Computational modeling of single particle scattering over large distances REBECCA RAPP, RAJAN PLUMLEY, MICHAEL MCCRACKEN, Washington & Jefferson College — We present a Monte Carlo simulation of the propagation of a single particle through a large three-dimensional volume under the influence of individual scattering events. In such systems, short paths can be quickly and accurately simulated using random walks defined by individual scattering parameters, but the simulation time greatly increases as the size of the space grows. We present a method for reducing the overall simulation time by restricting the simulation to a cube of unit length; each 'cell' is characterized by a set of parameters which dictate the distributions of allowable step lengths and polar scattering angles. We model propagation over large distances by constructing a lattice of cells with physical parameters that depend on position, such that the full set would represent a space within the entire volume available to the particle. With these, we propose the use of Markov chains to determine a probable path for the particle, thereby removing the need to simulate every step in the particle's path. For a single particle with constant velocity, we can use the step statistics to determine the travel time of the particle. We investigate the effect of scattering parameters such as average step distance and possible scattering angles on the probabilities of a cell.

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