Physics 77 Project Proposal

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We propose to develop a Monte Carlo simulation of diffusion processes in Python. Diffusion describes how particles spread out from areas of higher concentration to areas of lower concentration with respect to time. While the motion of individual particles may appear random, the cumulative effect follows rules allowing prediction for macroscopic properties of the system. We plan to generate the movements of numerous particles undergoing random walks in single and multi-dimensions according to diffusion rules. The positions of the particles will be updated step-wise over numerous time steps using Monte Carlo methods. By accumulating the overall movements of all particles at each time step, we can observe how the distribution evolves and spreads out. We believe that developing and analyzing such a simulation will provide more insights into the computational physics of diffusion and Monte Carlo method. If possible, The simulation could possibly be expanded to include diffusion in the presence of obstacles or boundaries, allowing us to study confined diffusion processes.