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A Table-Based Random Sampling Simulation for Bioluminescence Tomography

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Abstract

As a popular simulation of photon propagation in turbid media, the main problem of Monte Carlo (MC) method is its cumbersome computation. In this work a table-based random sampling simulation (TBRS) is proposed. The key idea of TBRS is to simplify multisteps of scattering to a single-step process, through randomly table querying, thus greatly reducing the computing complexity of the conventional MC algorithm and expediting the computation. The TBRS simulation is a fast algorithm of the conventional MC simulation of photon propagation. It retained the merits of flexibility and accuracy of conventional MC method and adapted well to complex geometric media and various source shapes. Both MC simulations were conducted in a homogeneous medium in our work. Also, we present a reconstructing approach to estimate the position of the fluorescent source based on the trial-and-error theory as a validation of the TBRS algorithm. Good agreement is found between the conventional MC simulation and the TBRS simulation.