CORRECTION OF ANISOTROPY COEFFICIENT IN ORIGINAL HENYEY GREENSTEIN PHASE FUNCTION FOR MONTE CARLO SIMULATIONS OF LIGHT TRANSPORT IN TISSUE

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Abstract

In this paper, two different methods for calculation of polar deflection angle are compared. The scattering angle is defined by numerical inversion of cumulative distribution of the original Henyey-Greenstein phase function. Results of the Monte Carlo simulations obtained in this manner are compared with results of simulations in which the analytical inversion of the probability density for the cosine of the deflection angle is applied. Investigations are carried out for media with optical properties similar to these typical for living tissues as well for very small source detector separations (50-500 μm), i.e. in conditions, in which the diffusion theory can not be applied.

The distributions of visiting probability of photons penetrating into the semi-infinite medium are obtained for various methods of phase function calculation. It can be observed that the methods of calculation of polar deflection angle influence significantly spatial distributions of reflectance and visiting probability obtained by Monte Carlo simulations. The approximated transformation of the anisotropy coefficient used in simulations carried out with the use of the original Henyey-Greenstein function to effective anisotropy coefficient is presented; that makes possible comparisons of the results of Monte Carlo simulations obtained by using different methods.

Keywords: Monte Carlo, phase function, light transport