Validation of GA-MCML algorithm against IAD program

B. Morales Cruzado[a], S. A. Prahl[b], J. A. Delgado Atencio[a], S. Vázquez y Montiel[a]

[a]Dept. of Optics, National Institute of Astrophysics, Optics and Electronics, Calle Luis Enrique Erro 1, Santa Maria Tonantzintla, Puebla, México.
[b]Oregon Medical Laser Center, Providence St. Vincent Medical Center, 9205 S.W. Barnes Rd Portland OR 97225, USA.

Abstract

Determining optical properties of turbid media has been performed by many research groups using a technique based on iteratively solving the radiative transport equation using the adding doubling technique (IAD). We present a new, alternative method, GA-MCML, for determining optical properties based on a Monte Carlo technique for radiative transport (MCML) guided by a genetics algorithm. The Monte Carlo method is more flexible than the adding-doubling technique and can be adapted to a wider range of sample geometries. The genetic algorithm is a robust search technique that is well-adapted to avoding the local minima in this optimization problem. GA-MCML, has been implemented by modifying the MCML source code to account for two common experimental problems: light losses due to the finite sample size and non-linear integrating sphere effects using Moffitt's equations. GA-MCML was validated by comparing with IAD method for data acquired at 632.8 nm on a set of phantoms using a single integrating sphere system. The GA-MCML results were equivalent to the IAD technique.