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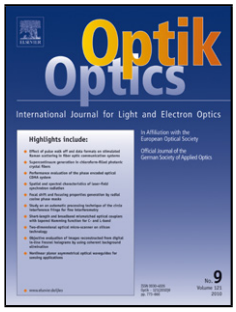

Title: Time <!–<query id="Q1">Please check the d̈ocheadf̈or correctness.</query>–>domain transport equations of light in multilayered rectangular biological tissue with semi-infinite medium

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Time domain transport equations of light in multilayered rectangular biological tissue with semi-infinite medium

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Abstract: In the study of tissue optics, physical models with the boundary of finite size are rarely established. Based on the diffusion equation, under the rectangular boundary conditions, this paper adopts extrapolation boundary conditions to establish a frequency domain model of multilayer medium diffusion equation, according to Fourier transform of frequency domain, turns the frequency domain solution into time domain model. On the basis of the deduced equation, the corresponding calculation process is written and the time resolved diffuse reflectance is calculated. The established model is compared with Monte Carlo simulation of time domain and the traditional medium with semi-infinite thickness, the result shows that our theory is correct. Concurrently, the effects of different boundary conditions on the diffusion equation are compared, it shows that our equations can not only solve the finite boundary problems, when the boundary is infinite, it can replace multilayer medium diffusion model.

Key words: diffusion equation, Monte Carlo simulation, tissue optics, time resolved diffuse reflectance

1. Introduction

Diffusion equations are widely used in biomedical optics, which can retrieve the optical characteristics of tissues and can perform noninvasive detection of biological tissues. Therefore, the diffusion model is one of the most widely used models, the diffusion model of medium with semi-infinite thickness is widely applied therein, for example, R. C.Haskell[1] established the time domain and