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Investigating Light Propagation In Turbid Media By Evaluating Optical Properties Of Phantom Tissues

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ABSTRACT

To study how light behaves inside a highly diffusing medium such as biological tissues; it is necessary to know the optical properties of the media. Our aim is to investigate how light propagates inside turbid media by evaluating the optical properties of phantom tissues. The studies were performed, *in vitro* by measuring optical properties of the medium. The properties to be measured were the absorption coefficient μ_a, the scattering coefficient, μ_s' and the asymmetry factor g. the phantom tissue which was evaluated was milk with the following results being obtained: $\mu_a = 3.5 \times 10^{-1}\ mm^{-1}$, $\mu_s' = 0.567\ mm^{-1}$, $\mu_s = 25.57\ mm^{-1}$, and g = 0.8803.

The influence of photon migration inside the diffusing medium was studied and photon trajectories inside the scattering medium have been modeled numerically with the Monte Carlo code. Comparison between the Monte Carlo results from different values of μ_s, *n,*and g were done for both the cw domain and the time domain at the transmittance and reflectance surfaces.

This thesis also discusses some of the present knowledge of the mathematical techniques used to describe light propagation in turbid media such as tissues. Attention has been paid to the usefulness and limitations of various techniques. The review the exact transport theory or the diffusion approximation, phase functions and measurement techniques has also been done.