

论文

基于蒙特卡罗模拟的超声辅助OCT成像研究*

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摘要:

通过蒙特卡罗模拟方法研究了超声波提高OCT成像质量的机理,以宏观经典理论和微观量子理论分别阐述了光和超声的相互作用,建立了存在超声辅助时光在生物组织中传播的模型,模拟了有超声辅助和无超声辅助两种情况下生物组织多次散射光的分布.模拟结果表明,与光平行射入生物组织的超声波能够使OCT成像系统中的多次散射光降低80%,携带组织信息的单次散射光在组织返回光中所占比重增大为无超声辅助时的2倍,从而增大了OCT成像的探测深度及图像对比度.

关键词: OCT 多次散射 超声 蒙特卡罗

Ultrasound-enhanced OCT: Monte Carlo Simulation

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Abstract:

The principle of ultrasound-enhanced OCT is analysed by Monte Carlo simulation,and the interaction of light and ultrasound is described in detail with classical and quantum mechanism.The model of light transmitting in biological tissue with ultrasound injecting into is built up and the distribution of multiple scattering light is simulated in two conditions: with and without ultrasound.The results prove that the ability of ultrasound injecting parallel with light into tissue to diminish the multiple scattering light in OCT,thus enhancing the ratio of single scattering light in the total OCT back-scattering light,increasing the detection depth and resolution.

Keywords: OCT multiple scattering ultrasound Monte Carlo

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