论文

基于旋转扫描探头的OCT内窥成像系统设计 *

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摘要：

为了同时获取样品的表面和深度信息,研究光学相干层析的成像原理,建立了基于光学相干层析技术的内窥系统,实现了旋转扫描成像,系统的工作波长为1 310 nm,工作带宽为80 nm.理论推导及计算机仿真得到了系统信噪比与干涉仪的分光比、反射率之间的关系并分析了理论分辨率和探测深度.提出外径为5 mm的内窥镜扫描探头,聚焦距离为12 mm,数值孔径NA为0.47,折射率分布常量A=0.218 7.利用微型电机驱动直角棱镜实现扫描,旋转速度为25 rpm,旋转一周得到640个采样点.采用多层盖玻片和洋葱表皮作为样品进行实验分析,得到了盖玻片和洋葱的图像,横向分辨率和纵向分辨率分别为10 μm和15 μm.结果表明,设计的光学相干层析内窥系统能够用于旋转扫描成像,获取更多的组织信息.

关键词： 光学相干层析（OCT），内窥成像，光谱，自聚焦，旋转扫描

Design of OCT Endoscopic Imaging System by Rotated Scanning Probe

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Abstract:

The principle of optical coherence tomography is studied and endoscopic system with rotated scanning is based in order to get the surface and depth information.The wavelength is 1310nm and the bandwidth is 80nm.The relation between SNR and prismatic ratio is deduced and computed| the resolution and extreme detecting depth are demonstrated.The endoscopic scanning probe with the 5mm diameter and the GRIN lens with NA=0.47 and A=0.218 7 are designed.The focus length is 12mm.An experiment uses a motor to drive prism to realize rotated imaging with the speed of 25rpm to get 640 points in one circle.The samples are multi-layer cover-glass and onion.The transverse resolution is 10 μm and the axial resolution is 15 μm.The result indicates that the OCT endoscopic system can be used for rotated scanning imaging to obtain more tissue information..

Keywords: Optical Coherence Tomography(OCT), Endoscopic imaging, Spectrum, GRIN, Rotated scanning

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