

光电信息获取与处理

一种提高共聚焦显微镜信噪比算法的研究

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摘要:

基于共聚焦显微镜的成像特点, 建立了Kalman滤波算法的理论模型, 把Kalman滤波方法引入到系统中, 提出一种基于图像像素的Kalman滤波算法, 并实现了实时化的Kalman滤波器。实验结果表明: 该算法能够有效地提高共聚焦显微镜信噪比, 但是以牺牲时间为代价, 提高系统分辨率的根本方法还是要着重考虑优化成像系统光路和探测电路。

关键词: 共聚焦显微镜 显微成像 Kalman滤波器 信噪比

Algorithm of improving confocal microscope SNR

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Abstract:

A theoretical model for Kalman filtering algorithm is established based on the imaging characteristic of the confocal microscope. The Kalmam filtering algorithm based on the image pixel is proposed and a real time Kalman filter is realized by means of the introduction of Kalman filtering method into the system. The experimental result shows that the algorithm can effectively improve the signal-noise-ratio (SNR) for the confocal microscopy imaging systems, but it is obtained at the expense of time. Therefore, the perfect method to improve the resolution of the system is to emphatically consider the optimization of the beam path of the imaging system and the detection circuit.

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参考文献:

[1] FRIED D L. Resolution, signal-to-noise-ratio, and measurement precision [J] . J. Op t. Soc. Am, 1979,69(3): 399-406.

[2] FRIED D L. Resolution, signal-to-noise-ratio, and measurement precision, addendum [J] . J. Opt. Soc. Am, 1980,70(6): 748-749.

[3] SANDISON D R, WEBB W W. Background rejec-tion and signal-to-noise optimization in confocal and alternative fluorescence micro-scopes [J] . Applied Optics, 1994,33(4): 603-615

[4] SCHMITT T, GEBAUER H D, FREYER R. Re-storation of nuclear medicine images using a Kalman filtering approach [J] . SPIE, 1995, 2421: 64-69.

[5] LAPLANTE P A, NEILL C J. A class of Kalman filters for real-time image processing [J] . SPIE, 2003, 5012: 23-29.

[6] DZIELINSKI A, SKONECZNY S. Recurrent neural network application to image filtering. 2-D Kalman filtering approach [J] . SPIE, 1991, 1451: 234-241.

[7] TAO Hong-jiu, WANG Yue, ZHOU Zu-de. Study of image super resolution reconstruction algorithm

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based on Kalman filter movement estimation [J]. SPIE, 2005, 5637: 406-412.

[8] BIEMOND J, JELLE R, GERBRANDS J J. A fast Kalman filter for images degraded by both blur and noise [J]. IEEE Trans. On ASSP, 1983, 31: 1248-1256.

[9] WILSON T C, SHEPPAND J R. Theory and practice of scanning optical microscopy [M]. London: Academic, 1984.

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2. 向世明. 微光像增强器信噪比理论极限问题研究[J]. 应用光学, 2008, 29(5): 724-726
3. 赵贵军;李宪圣;任建伟;万志;任建岳. 反射式TDICCD光学传感器波段选择[J]. 应用光学, 2008, 29(3): 326-329
4. 周斌;刘秉琦;满波. 微光像增强器图像传递信噪比的测试研究[J]. 应用光学, 2004, 25(5): 60-61
5. 王朝晖;赵长政;陈文新;焦斌亮. 振动对星间相干激光通信的影响[J]. 应用光学, 2007, 28(3): 336-340
6. 潘京生;苏德坦;许志清;刘术林. 一种显著提高三代像增强器信噪比的微通道板[J]. 应用光学, 2007, 28(3): 301-304
7. 陈新锦;袁艳;李立英;肖相国;刘辉. 目标探测的信噪比分析[J]. 应用光学, 2007, 28(4): 397-400
8. 胥杰;蒙文;李玉江;杨庆华. 一种提高激光告警器性能的自适应方法[J]. 应用光学, 2006, 27(1): 43-45
9. 刘术林 董煜辉 孙建宁 邓广绪. 微光像增强器信噪比与MCP电压关系[J]. 应用光学, 2009, 30(4): 650-653

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