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光电信息获取与处理

基于CCD的乳腺X线摄影图像预处理方法的研究

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摘要：

为提高由闪烁屏到CCD的光耦合效率，减小大相对孔径和近距离成像造成CCD图像严重失真，提出一种有效补偿图像失真的预处理方法。该方法根据物像共轭关系将物面划分为与图像传感器像素相对应的许多微小物元，应用蒙特卡罗方法模拟从每一物元发出的光在像面上形成的光分布，即点扩散函数。由所有物元的点扩散函数构成一个点扩散数组，数组的每一行对应一个物元的点扩散函数。基于该点扩散数组建立描述像元与物元关系的线性方程组，解线性方程组可得到接近实物的图像。用实际光学系统的计算结果验证了该方法的有效性。

关键词： 乳腺X线摄影 CCD 蒙特卡罗模拟 点扩散函数

Method for preprocessing mammography image based on CCD

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Abstract:

The key to apply CCD to implement mammography is to improve the coupled efficiency of light from scintillation screen to CCD, and it is necessary that the image system has a large relative aperture and adopts close imaging, which makes the CCD image seriously distorted. This paper presents an efficient preprocessing method to compensate image distortion. According to the conjugate relation between the object and its image, the object plane was divided into many micro object elements that have one-to-one correspondence with the pixels of image sensor; Monte Carlo method was used to simulate the light distribution on image plane made by the light from each object element, namely point spread function. A point spread array was constructed from all point spread functions of all elements; each row of the array corresponds to the point spread of function an object element. A linear system of equations to describe the relation between all object elements and all image pixels was built on the basis of the point spread array, and a lifelike image was obtained by solving the linear system of equations. The calculation results for an actual optical system verified the validity of the method.

Keywords: mammography CCD Monte Carlo simulation point spread function

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