

摘要：对CCD相机在激光辐照下的暂时性失真问题进行了研究。用532 nm连续激光辐照以线阵CCD为图像传感器的Piranha HS-41-02K30相机进行了实验，实验发现，激光光斑和3个与其大小、形状皆相似的暗斑同时、等间距地出现于感光阵列方向上。这些暗斑即为CCD相机在激光辐照下的一种暂时性失真现象，本文称这3个暗斑为光斑阴影。根据实验数据分析了这一现象的规律和产生机理。分析认为，CCD图像传感器4个并行读出电路因共用同一偏置源而相互影响是产生光斑阴影现象的内在机制。推导了共偏置并行电路信号之间相互影响的关系式，由得到的关系式可知，降低公共偏置源与并行读出电路公共节点之间的电阻可减弱上述阴影失真现象；而用4个电压源分别为并行读出电路提供偏置，可以消除这种光斑阴影现象。本文推导的共偏置并行电路影响关系式不仅可解释阴影现象，也可设计CCD器件时减弱或消除阴影失真提供借鉴。

关键词：CCD相机 激光光斑 光斑阴影 并行读出电路

Shadows of laser spots in CCD and their mechanism

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Abstract: The transient distortion of a CCD under laser irradiation is explored. A HS-41-02K30 camera with a linear CCD image sensor is irradiated by a 532 nm CW laser, and the experiment shows that a laser spot and three dark spots with the similar size and shape appear in the direction of photosensitive array with an equal space synchronously. These dark spots are a transient distortion phenomenon of the CCD camera under laser irradiation, and are named the shadows of laser spot in this article. The regularity and generation mechanism of the shadow phenomenon are analyzed. It suggests that the inner mechanism of generating shadows is the interaction between four parallel readout circuits of CCD which share the same bias. The expression describing the interaction is deduced, which indicates that reducing the resistance between the bias source and the common node of four readout circuits can weaken the shadow phenomenon, and using four voltage sources to provide bias for four readout circuits respectively can eliminate the shadow phenomenon. Obtained results point out that the expression deduced by this paper not only can explain the shadow phenomenon but also can provide references for the design of CCD in weakening and eliminating the shadow phenomenon.

Keywords: CCD camera Laser spot shadows of spot parallel readout circuits

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