Annals of the Academy of Romanian Scientists
Series on Science and Technology of Information
ISSN 2066-8562 Volume **1**, Number **2**/**2008**

ALGORITHM FOR COMPUTATION OF DARK FRAMES IN A CMOS IMAGER

Ralf WIDENHORN[1], William C. PORTER [2], Justin C. DUNLAP [3], Erik BODEGOM [4]

Rezumat. *Curentul de întuneric este produs de electronii excitaţi termic în banda de conducţie, care creează astfel un semnal fals ce se adaugă imaginii digitale. Se prezintă un algoritm care corectează automat acest efect în cazul unui „imager" CMOS disponibil în comerţ folosind un protocol de calibrare care să caracterizeze senzorul de imagine pentru diferite temperaturi, diferiţi timpi de expunere şi diferite setări ale amplificării. Protocolul de calibrare foloseşte pixeli fierbinţi, care au cel mai mare raport semnal/zgomot, drept indicatori ai curentului de întuneric în restul chip-ului. Curentul de întuneric al pixelilor fierbinţi cu comportare bună pot astfel să fie folosiţi pentru a prevedea curentul de întuneric al tuturor pixelilor din chip, făcând astfel posibilă o precisă corectare a întregii imagini.*

Abstract. *Dark current is caused by electrons that are thermally excited into the conduction band, adding a false signal to a digital image. We present an algorithm that automatically corrects for dark current in a commercially available CMOS imager by using a calibration protocol to characterize the image sensor for different temperatures, exposure times, and gain settings. The calibration protocol uses hot pixels, which have the highest signal-to-noise ratio, as indicators of dark current in the rest of the chip. The dark current of well-behaved hot pixels can thus be used to predict the dark current of all pixels on the chip, making possible an accurate correction for the entire image.*

Keywords: digital images, CMOS, image correction, dark current

1. Introduction

Dark current is a major source of noise in digital imagers. To decrease the generation of dark current, many camera systems are cooled. In some cases, e.g. consumer cameras, a cooling system is not feasible and dark current can become a problem even for short exposures.

A standard method for dark current correction is to take a so-called dark frame, an exposure with a closed shutter, either right before or right after the light exposure. This dark frame is subsequently subtracted from the actual image.

Previously [1], we reported on a method to compute the dark frame for a CCD imager from the actual image which we want to correct for the dark current.

[1] Prof., Physics Department, Portland State University (ralfw@pdx.edu).
[2] PhD Student, Physics Department, Portland State University.
[3] PhD Student, Physics Department, Portland State University.
[4] Prof., Physics Department, Portland State University (bodegom@pdx.edu).