International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **2**, February **2010**

 ISSN 1349-4198
pp. 747–754

AN EFFICIENT COLOR INTERPOLATION METHOD FOR DIGITAL STILL CAMERA

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Received July 2008; revised December 2008

Abstract. *In order to reduce cost, most digital camera manufacturers use a single sensor along with a color filter array to record one of the three primary colors: red, green or blue at each pixel location. Thus, a process called color filter array interpolation is required to reconstruct a full-color image. In this paper, an efficient interpolation scheme which exploits both spatial and inter-channel correlations is presented. The experimental results show that the proposed method performs well in terms of visual quality and PSNR. Furthermore, the proposed method requires low computational complexity, so it can be applied to many real-time applications where the VLSI implementation is required.*
Keywords: Color filter array, Color interpolation, Demosaicking, VLSI implementation

1. **Introduction.** Because digital images have many advantages over analog images, digital still cameras (DSCs) are getting popular. More and more people take pictures with DSCs instead of film cameras. When a digital image is recorded, it requires processing to provide a viewable image, including correction for sensor nonlinearities and nonuniformities, white balance adjustment, compression and more [1-15].

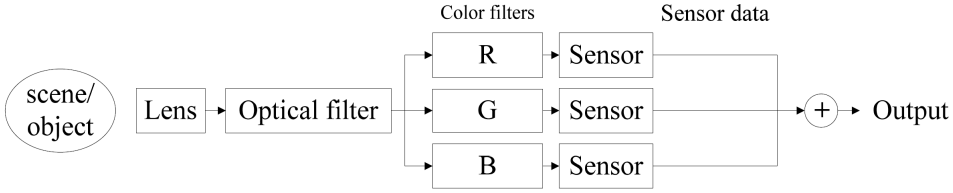

Figure 1. Three-sensor digital camera architecture

Based on the RGB color model, each complete color is composed of three primary colors: red, green and blue. Thus, three separate sensors are required for a DSC to measure the image completely. Figure 1 shows the three-sensor architecture of a professional DSC. However, the sensor is usually the most expensive part of a DSC. For this reason, many cameras use a single sensor along with a color filter array (CFA), shown in Figure 2, to record only one of the three primary colors in each pixel to reduce the cost and complexity. Since there is only one color value available in each pixel, the two missing color values must be estimated to construct a full-color image. This image reconstruction process is called CFA interpolation or CFA demosaicking [2-12].

There are several patterns for the filter array, and the most common one is the Bayer pattern [1] shown in Figure 3. The green channel is sampled on a quincunx grid, and the red and blue channels on rectangular grids [2]. Because the peak sensitivity of human visual system lies in the green portion of the spectrum, the green channel is sampled at