

Image Sensor Color Correction

Introduction

This reference document will describe the basic process to obtain colors from a digital image sensor.

Basic Process to Obtain Color Images from Digital Image Sensors

CCD and CMOS solid-state image sensors contain an array of photosensitive elements called pixels. The pixels collect light from a scene and convert it into electrical signal. The signal is then digitized and processed. Digital cameras use CCD or CMOS image sensors to capture images.

Silicon-based image sensors are sensitive to light with wavelengths from up to 1,050 nm, as shown in Figure 1.

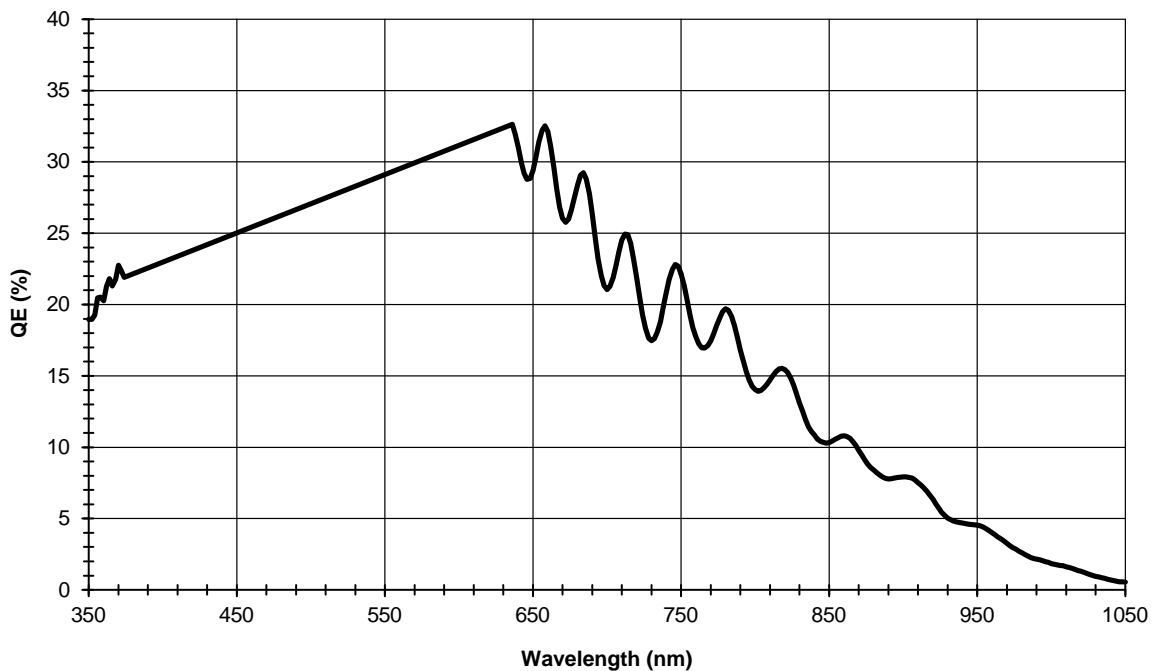


Figure 1. Spectral Response of a CMOS Image Sensor

Images captured by a solid state image sensor are, therefore, monochrome in nature. To generate a color image,

After capture, the signal of each pixel is read out sequentially; digitized and stored in memory. The original data for each pixel only contains information about one color, depending on which filter is positioned over that pixel. However, information for all three primary colors is needed to construct a color image. The missing information is extracted based on the information gathered by the neighboring pixels. This is called “color interpolation”.

There are a variety of interpolation methods, such as “Nearest Neighbor Interpolation”, “Bilinear Interpolation”, and “Bi-cubic Interpolation”, etc. These simple methods are described in the literature. The quality of the final image depends in large part on which algorithm is used. For this reason many camera manufacturers consider their best color interpolation algorithms to be trade secrets and do not publish them.

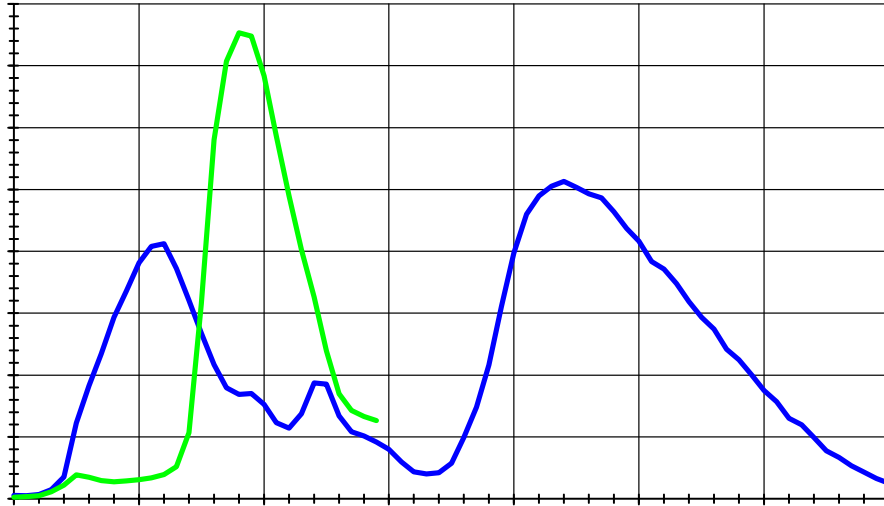


Figure 3. Spectral Response of a CMOS Sensor with RGB CFA

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