Algorithms for Digital Color Cameras

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While digital color imaging has many problems in common with conventional silver halide imaging, it also has its own particular problems not faced in the analog world. Two of these problems, and two corresponding algorithmic solutions, are illustrated by example and discussed in detail. In addition, a mathematical perspective is presented to explain how these algorithms work.

The first problem is that of color interpolation (also called demosaicking). The pixels of most silicon sensors capture a single color measurement, usually a red, green, or blue color value. Because a fully processed color image requires all three color values at each pixel, two additional color values must be provided at each pixel. An algorithm is presented that addresses this problem for sensors using the Bayer color filter pattern.

The second problem is that of color aliasing. While the problem of aliasing is always present in a discrete imaging system, it is compounded for color sensors because the different color channels can alias in different ways. The resulting interference patterns have distinctive color components which constitute an obvious and annoying imaging artifact. An algorithm is presented that addresses this problem for sensors using the Bayer color filter pattern.