SEAK RFI Response Template

Respondent/Contact Information

PNNL

Application Domain

Hyperspectral imaging / Wide Area Motion Imaging (WAMI)

Constraining Kernel

Debayer. The debayer kernel takes as input a Bayer array image with one sample per pixel and returns an image with RGB (three) samples per pixel where the missing colors have been estimated via interpolation using the approach described in [Malvar, He, Cutler 2004].

Metrics (correctness, performance, power, etc.)

Correctness

Because of the limited precision of the incoming pixels values, the specific weights used for the Debayer kernel, and the use of unsigned 16-bit integers for output, the output pixel values should match the “golden” output values exactly.

Performance

Time (seconds) per unit work, where the unit of work is the number of output pixels. For an image of height Y and width X, there are Y × X units of work.

Power

Power (Watts) per unit work.

Description/Discussion

Modern imaging sensors produce a very large amount of data from which useful information must be extracted. For example, one important WAMI system acquires a 1.8 gigapixel image at a rate of greater than 12 Hz. The Debayer kernel is an important processing step of a WAMI processing chain. It is common to use digital cameras with a single charge coupled device (CCD) array where each CCT element samples only a single color (red, green, or blue). The Debayer kernel uses interpolation to estimate the colors not sampled at a given pixel so that the resulting image has red, green, and blue (RGB) values for each pixel.

Input

A 2D array (image) of Y × X pixels sampled in a Bayer pattern.

Output

A 3D array (image) of dimension 3 × Y × X where each of the Y × X pixels is defined by a triple of red, green, and blue (RGB) values. Each output pixel is computed using an interpolation mask that utilizes a 5 × 5 footprint centered on that pixel.

Important computational characteristics

For each of Y × X pixels, the two colors that were not natively sampled will be interpolated via a 5 × 5 interpolation foot-print, which requires both multiplication and summation. For points in the interpolation footprint that are defined to be zero, no operations need to be performed.

Further information (pointers to papers, code, etc.)

Henrique S. Malvar, Li wei He, and Ross Cutler. High-quality linear interpolation for demosaicing of Bayer-patterned color images. In *Proc. of IEEE ICASSP*, volume 3, pages 485–488, 2004.

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